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My Painted Plate: Nutrition-Related Art Enhances the Effects of Nutrition Education

Abby Helene Forman
University of Tennessee - Knoxville, aforman@vols.utk.edu

To the Graduate Council:

I am submitting herewith a thesis written by Abby Helene Forman entitled "My Painted Plate: Nutrition-Related Art Enhances the Effects of Nutrition Education." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Nutrition.

Sarah E. Colby, Major Professor

We have read this thesis and recommend its acceptance:

Katie Kavanagh, Marsha Spence

Accepted for the Council:
Dixie L. Thompson

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

My Painted Plate: Nutrition-Related Art Enhances the Effects of Nutrition Education

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DEDICATION

To my mother, father, and brother

Mike and Joni Forman and Matt Forman

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ABSTRACT

Background: A few studies have shown that art–based nutrition education (primarily in the form of theater) can increase nutrition knowledge and change behavior. Little research exists on the use of visual arts in nutrition education programs. The purpose of this study was to determine the impact on children's nutrition knowledge, self-efficacy, and behavior, of using visual art and differing levels of intensity of art activities in nutrition education.

Methods: The study used a three-armed cluster randomized control trial design with three time points. Children ages 8-12, at 6 different summer camps in Knoxville, Tennessee, attended the My Painted Plate program. The program included six nutrition lessons, two taught per week, over six weeks. Camps were randomly assigned to one of three arms. All three arms received the same six 30 minute nutrition education lessons. After each lesson, the control arm participated in 30 minutes of art, which was unrelated to nutrition. The Standard arm participated in 30 minutes of nutrition-related art (drawing MyPlate meals on paper plates). The enhanced arm participated in 30 minutes of more intense nutrition-related art (painting MyPlate meals on ceramic plates). Assessments were conducted at baseline, post (after the six lessons), and follow-up (two weeks after the post assessments). Assessments included nutrition knowledge, self-efficacy, dietary behavior surveys, and an evening meal recall to determine dietary adherence with the MyPlate recommendations. Evening meal recalls were entered into NDSR, and all data analysis was conducted with SPSS using repeated measures ANOVA.

Results: Sixty-nine participants completed the My Painted Plate program. Those participants who received the standard and enhanced interventions had statistically significant increases in nutrition knowledge compared to controls. All participants had increases in self-efficacy, with a larger, but not statistically significant increase occurring for the enhanced participants. No changes in behavior were observed in any group.

Conclusions and Implications: Inclusion of nutrition-related visual arts with traditional nutrition education is more effective than education alone at improving nutrition knowledge and self-efficacy. Both high and low intense forms of nutrition-related art equally increase knowledge gains along with the improvements in self-efficacy experienced by all participants.

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CHAPTER 1: LITERATURE REVIEW

Using Art to Enhance Nutrition Education with Children

Introduction

Childhood obesity rates may have begun to plateau, but they are still well above desirable.[1] An estimated 16.9% of children and adolescents, ages 2-19, are obese.[1] Alarmingly, more than one third of all children and adolescents in the United States are currently overweight or obese. Children who are currently obese are at least two times more likely to become obese adults than children who are not obese.[2] Obesity is linked to many risk factors for health complications such as type 2 diabetes, high cholesterol, heart disease, stroke, kidney disease, liver disease, and certain cancers.[3–5] Along with the health risks, overweight and obese children are at increased risk for negative social, psychological, and emotional outcomes from bullying, depression, and lower self-esteem.[2,6,7]

According to the Centers for Disease Control and Prevention (CDC), poor diet is linked to an increased risk of overweight and obesity.[8] Although only indirectly linked with obesiy,[9,10] a major current focal point of the healthfulness of children's dietary habit is adequate consumption of fruits and vegetables (FV). The national average of FV intake remains much lower than the recommended 5 total servings each day.[11–14] According to the State Indicator Report for 2013, the national average intake of FV was less than 2 servings per day for adolescents and adults.[12] The latest Vital Signs report from the CDC shows that children ages 2-19 are consuming about 0.40 cups of fruit per 1000kcal, and 0.53 cups of vegetables per 1000kcal, compared to the CDC's Healthy People 2020 objectives,[15,16] recommended 0.9 cups of fruit per 1000kcals and 1.1 cups of vegetables per 1000kcals. Fruit and vegetable intake is a large part of a healthy diet.[11,17] Fruits and vegetables supply essential vitamins and minerals,

dietary fiber, and beneficial phytochemicals.[11,18] For children especially, eating fruits and vegetables has been shown to aid in lung function and reduce the effects of asthma and the risk of chronic obstructive pulmonary disease (COPD).[17] Throughout life, intake of FV can lower the risk of many chronic diseases and aid in weight management.[11–14,17] Intake of FV has also been shown to reduce the risk for chronic diseases such as cancer, heart disease, stroke, cataracts, diverticulosis, chronic obstructive pulmonary disease, and hypertension.[17] The emphasis on health benefits beyond childhood are important because growing evidence suggests that fruit and vegetable consumption habits are formed in childhood and track into later life.[19–21]

Fruit and vegetable intake has been linked to improved diet quality which has been associated with prevention of childhood obesity.[14,22] One way to influence fruit and vegetable consumption, thus improving diet quality, is through nutrition education. Although nutrition education alone does not necessarily change behavior, it can be an important step in the behavior change process.[23,24] Given the current national concern for childhood obesity and low fruit and vegetable intake, there is an increased need to reach children with effective nutrition education.

The Knowledge, Attitudes, and Belief (KAB) model is commonly used in nutrition education, and is easily integrated into school-based settings, as it mimics the design of classroom teaching methods.[23,24,26] Self-efficacy is often used as the primary construct for attitude within the KAB model. While education alone may not lead to direct behavior changes, knowledge and self-efficacy have been shown to be potentially powerful mediating variables in influencing healthy behavior changes,[24,28–31] and may help to explain the mechanism by which nutrition education functions within a behavior change model. Many different elements are often incorporated into nutrition education approaches, and art is one of the elements often incorporated.[32]

Art

Art has been tied to health and science even before the Greeks first studied human anatomy through drawings and sculpture. The incorporation of art into non-nutrition academic settings has proven to yield positive effects.[33–37] It has been shown to boost learning and achievement for young children, especially those from economically disadvantaged circumstances.[35–37] Participation in the arts helps children develop attention and memory retrieval skills, increases cognitive development, problem solving, information processing, and overall intelligence.[35–37] The arts have been used effectively in other non-nutrition health behavior fields such as alcohol and tobacco use prevention, HIV/AIDS prevention, sex education, correctional and delinquency rehabilitation, prosocial campaigns, and illness-specific art therapy.[33,34,36,38–40] The positive results from health behavior programs such as these lead to the question: "Would the use of art in nutrition education increase the effectiveness of the education?"

Objectives

The objectives of this literature review are to critically examine the current studies on the use of art in education programs to enhance the effects of these programs on nutrition knowledge and behavioral changes and to identify gaps in the current literature.

Search Strategy

The literature search was conducted using an array of search methods. The preliminary research was done through *PubMed* and *Web of Science* databases. Keywords used include: *art, artistic, art-based, visual-arts, visual, theater, creative, nutrition, obesity, children, childhood,*

children, intervention, behavior, behaviour, portion, plate, diet, food, dance, music, and draw. Additional search criteria excluded the following: the use of the acronym, *ART for Anti-retroviral Therapy used in the treatment of HIV, and the words HIV, AIDS, and HIV/AIDS.*

Criteria for Selection

Studies were selected for review based on the target age range, nutrition education focus, behavioral change focus, and inclusion of an art-based activity. An initial search was conducted with an elementary school age focus, but limited search results prompted the expansion of the search criteria to include older children at later cognitive development points. As a result, those studies using children between the ages of 7 and 18 were included in the review. This age range captures both the concrete operational stage (ages 7-11) and the formal operational stage (age 11-adulthood) of the Cognitive Development Theory (CDT).[41,42] The concrete operational stage is characterized by the ability to classify experiences, think causally, and is limited to concrete objects and experiences. The formal operational stage marks the beginning of more abstract thought, and the ability to think through alternative hypotheses such as those involved in eating behavior changes to increase health.

Programs that were nutrition focused and that used theater, dance, or visual art forms were included. Both school-based and extracurricular programs were included, with no exclusion of those that focused on specific SES levels or racial/ethnic populations.

Extraction of Data: See Appendix A

Synthesis

This section of the literature will be approached for synthesis of the same articles in two ways. First each individual study will be reviewed separately. Then the studies will be further examined by the type of art used in the study.

Synthesis by Review of Studies

The reviewed literature included three randomized control trials (RCT),[43–45] two pilot RCTs,[45,46] one pilot quasi-experimental pre/post design,[48] three quasi-experimental pre/post designs,[49–51] and one non-experimental design.[52] One "rapid systematic review"[32] was used and included two of the studies.[43,50]

Colby et al 2007[43] was a RCT study targeted towards children of Hispanic immigrants. The theater-based nutrition education intervention included 19 children ages 8-12, and consisted of four 90-minute theater and nutrition sessions. Sessions took place five days per week for four weeks. Participants discussed nutrition handouts at each session, and wrote and performed their own play. Pre- and post-surveys measured nutrition knowledge, attitudes, behaviors, and beliefs. The results of this study included a 25% increase in nutrition knowledge, attitudes, beliefs, and behaviors compared to the control group.

Olvera et al 2010[45] was a RCT study titled BOUNCE which targeted low-income Latino mother and daughter dyads for a nutrition and physical activity intervention incorporating dance. Participants included 46 mother and daughter dyads (daughters were 7-13 years old). Both the experimental and control groups received 12 weeks of 90-minute sessions. The experimental group received three weeks of structured dance aerobic groups and sport sessions, two weekly nutrition sessions, and one weekly behavioral counseling session. The control group received 45 minutes of written education materials on various nutrition and counseling topics, and 45

minutes of light aerobic or sports activity. Pre- and post-intervention fitness tests and intake reports were used to measure behavior change. The study found that the daughters had increased fitness, but no increase in reported physical activity. In this study the daughters' food intake reports also indicated trends in reduced intake of high fat foods and increased consumption of fruits and vegetables.

Perry et al 2004[44] was a pilot RCT study in 26 Twin City metropolitan area elementary schools in Minnesota with 1668 children from first through third grade. The study aimed to increase fruit and vegetable consumption at the schools through a cafeteria-based daily intervention and special events. Daily activities included increasing availability, attractiveness, and encouragement of fruit and vegetable intake. Examples of special events included students viewing a theater production about nutrition. The 26 schools were randomly assigned to either the cafeteria-based intervention or control groups. The study took place during two consecutive school years, with baseline lunch observations taking place in spring 2000 and follow-up observations in spring 2002. The results of the study showed significant increases in total fruit intake at intervention schools. Results were associated with verbal encouragement from food-service members.

Bohnert et al 2011[47] was a pilot RCT study to test the feasibility of a portion plate for children. The 16 study subjects were primarily African American low-income children ages 11-17 years old. Due to low recruitment from the surrounding area, participants were also recruited from the local teen weight loss clinic. The study consisted of 2 phases, each with two arms. Phase 1 consisted of two 30-minute nutrition education sessions. The first arm of phase 1 helped to design the Nutri-plate based on their nutrition education lessons. The second arm of phase 1 participated in time-matched nutrition games. Phase 2 consisted of two hour-long weeknight

dining sessions, where the two arms either used the Nutri-plates designed during phase 1 or a plain plate. Results of the study showed that participants using the Nutri-plate did select more fruits and less food overall, but it did not influence their healthful food selections.

Neumark-Sztainer et al 2009[46] was a pilot RCT study that targeted parents and children (61 and 96 respectively) from four urban schools in St. Paul, Minnesota. The study consisted of two theater based intervention arms for 4th-6th grade students (mean age of 10.3 years). Each arm of the study included two schools. At the experimental study arm locations, students participated in a theater-based nutrition education program, after-school sessions, and take-home family component. At the end of the 14 theater sessions and eight booster sessions, the students performed the play and script developed from their beginning activities. The theater-based control arm had students perform a prewritten play focused on environmental health issues. While the results of the study reported increased child awareness of the need for behavior change, this awareness was not significant enough to lead to behavior change. The study also reported a negative outcome of increased child reported parental weight talk (comments directed toward the child about their weight or dieting).

Koch et al 2012[48] was a pilot study described in a published poster abstract. This study evaluated a program in which 1207 New York City public school children used fruits and vegetables as their subjects for creating artwork. The program provided 12 nutrition and art lessons where students tasted fresh fruits and vegetables and made action plans to eat more fruits and vegetables. No control group was used and nutrition knowledge was measured using self-reported pre- and post-surveys. The results of this study reported increases in nutrition knowledge and students' desire to increase healthy eating.

Engels et al 2005[49] was a pre-post experimental study targeting African American students and their parents at an urban middle school in Detroit, Michigan. The study recruited 56 students (mean age 11.1 years old) for the 12-week after-school program consisting of 60-75 minute sessions, four days per week, for both parent and child. Sessions included health education focused on promoting fruit and vegetable intake, and fitness activities such as dance. No control group was used for this study. Blood pressure, a food frequency questionnaire, body fat, heart rate, and a fitness run/walk test were used to assess changes from baseline. The results of this study showed that the children gained more diet-related health benefits from the intervention, while parents derived more fitness-related benefits.

Jackson et al 2010[50] was a quasi-experimental pre-post test study targeting low-income urban African American children, ages 11-13 years. The study consisted of a focus group of eight students and a pre-post multicomponent intervention with 15 adolescents. The multicomponent intervention included six weeks of two afterschool lessons per week. Lessons included art, nutrition, and physical activity components, culminating in students writing and performing their own "healthy skits". No control group was used for this study. The focus groups provided audio-recorded feedback on the lessons, and knowledge changes were measured using a pre- and post-survey. No changes were found between pre- and post-surveys.

Perry et al 2002[51] was a pre-post test study targeting elementary school children from the Twin Cities metropolitan area. The study subjects included 1927 children from 20 area elementary schools with a mean age of 9.6 years. The study used a professionally written and performed play to elicit nutrition behavior change and nutrition knowledge. No control group was used for the study. Behavior change, food choices, nutrition knowledge, and food recall were measured using pre- and post-surveys that focused on themes addressed in the play. The

study reported statistically significant increases in knowledge and food choices related to fruit and vegetable consumption as compared to other nutrition education programs.

Cueva et al 2012[52] was a non-experimental qualitative observational report on the "Wellness Picnic". Participants in this activity draw their ideas of wellness on paper plates and then share their artwork and ideas with the group. The Wellness Picnic participants in this report included Alaskan Native American families of all ages. Participants shared positive feelings (?) about the event and said that their awareness of healthy behaviors was increased by the activity.

In summary of the studies described above, positive changes in nutrition knowledge were reported by three of the studies.[43,48,51] These studies all had a nutrition education component to their interventions and measured knowledge increases using pre- and post-surveys. Diet related behavior changes were measured in eight of the studies.[43–49,51] Of these, five reported positive changes in diet related behavior change.[43–45,48,51] Food intake or recall was measured by three studies.[44–46,51] Perry et al 2004[44] conducted lunch observations to attain quantitative data on behavior change related to fruit and vegetable intake. Olivera et al 2010[44] used an undescribed intake report to conclude that the daughters in their study had reduced intake of high fat foods, and increased consumption of fruits and vegetables. Perry et al 2002[51] used a food recall survey and found increased fruit and vegetable consumption among students in their study. The other two studies that measured dietary behavior, Koch et al 2012[48] and Colby et al 2007,[43] used pre- and post-surveys to ascertain participants change in awareness, desire, and intent to change eating behaviors. While some studies did not show meaningful change in either nutrition knowledge or behavior change,[47,49,50] none of the studies reported negative or detrimental results.

Synthesis by Type of Art

The types of art used in studies in this review varied. The studies can be grouped into those that used either theater,[43,44,46,50,51] visual arts,[47,48,52] or dance.[44,48]

Theater

The most frequently used method was theater-based interventions.[43,44,46,50,51] Perry et al 2002[51] used a nutrition related theater production as one of its many booster events, over the two year cafeteria-based fruit and vegetable intake intervention. Perry et al 2004,[43] another school-based intervention in the Twin City metropolitan area, used a theater production as the main component of its intervention. In this study a professional theater company wrote and performed "All's Well That Eats Well" for 20 elementary schools.[51] This was the largest study reviewed, with 1927 children, mean age 9.6 years old. No control group was used for this study; however pre- and post-surveys were still able to reveal a statistically significant effect on knowledge and food choices related to increased fruit and vegetable consumption. The study used a one-day food recall survey in which students circled fruits and vegetables they consumed the day before out of a list of 10 choices. While positive results were reported, the behavior change measurement method, including only 10 food choices and a one-day recall, may have been a limitation and source of recall bias. This study also used reinforcement materials for students to complete at home with their parents. These take-home activities were not separately measured as a variable, making it difficult to determine if knowledge and behavior change results are due to the viewing of the play or the additional materials.

Three of the studies had the children participating in the performance of the play developed during the program.[43,46,50] One study had the researchers write the play based on the participants' beginning activities.[46] The other two used scripts written by the participants,

allowing for an even greater level of creative involvement.[43,50] Strong results were gathered from Colby et al 2007[43], which was a peer-led theater nutrition education program targeting 19 Hispanic immigrant children ages 8-12. The four-week program aimed to promote a traditional, healthful, Latino diet to Mexican American children. The program integrated nutrition education with explorative theater exercises to address the participants' beliefs about the "American diet" versus their "traditional Latino diet". The pre-survey and theater exercises revealed that the participants defined the "American diet" as hot dogs, hamburgers, pizza, and french fries. Many of the children communicated feelings of desire to assimilate with the American culture, including the diet. The intervention attempted to work through their current behavior attitudes and educate participants on the health benefits of their traditional Latino diet, defined as beans, fruits, and vegetables. A qualitative pre- and post- knowledge, attitudes, beliefs, and behaviors (KABB) survey and individual interviews were used to assess the programs results. Matched controls were used from a preexisting database. The program yielded a 26% increase in nutrition knowledge and positive changes in attitudes, beliefs, and behaviors. Positive changes were seen in increased "belief that the American diet was less healthy than the traditional Mexican diet" and in "children planning to try and like more beans, fruits, and vegetables".[43]

The culturally relevant nutrition messages were used to help reach the participants on a personal level. The study used participants' own definitions of what an "American diet" was compared to a "traditional Latino diet". This does reduce the generalizability of the specific program. However, design elements may be translatable to other cultures or demographic groups. The study specified that the nutrition education was integrated into the theater activities, not simply held as a separate entity. Many of the other studies also chose to combine the art and nutrition components instead of teaching them separately. The theater model showed potential as

an art-based nutrition knowledge intervention style to use with elementary school aged children. More testing is needed to determine if intent to change can lead to measurable behavior changes, and if any behavior changes made can be sustained long term.

Visual arts

Three studies used visual arts as their creativity component.[47,48,52] Each of these studies was very different in research design. Two were pilot studies yielding limited results,[47,48] and only one contained a control group.[47] The third was a non-experimental "Wellness Picnic" exercise designed to encourage reflective conversations about total health and wellbeing using pictures and colors.[52] No data were presented in this article. However, they reported that the exercise is widely used across age groups and health statuses, especially with those of chronic diseases.

While many of the studies had primary measures of nutrition knowledge and secondary of potential behavior change markers, one study attempted to measure behavior directly. Bohnert et al 2011[47] was a pilot study to develop and evaluate a potential portion plate for adolescents in order to directly affect what they put on their plates at mealtime. Sixteen participants were all provided with 30 minutes of nutrition education. Half of the participants were given 30 additional minutes to discuss their learning, and brainstorm designs for the portion plate with the help of a graphic designer. The design group was encouraged to draw pictures and write down key elements they wanted incorporated into the plate. The other eight participants in the non-design group had 30 additional minutes of nutrition-based games but did not have an additional visually stimulating creative component. Once the final design was selected, the two groups were further divided into those who would receive the portion plate to use during a mealtime experiment and those who would use plain plates. The small sample size that resulted

from dividing participants into four groups caused large limitations for the study. The secondary hypothesis of whether designing and using the portion plate made a difference could not be tested. Due to initial recruitment problems, the researchers decided to draw further participation from the neighboring weight loss clinic, creating selection bias and potential confounders. The participants represented multiple BMI categories. Ten of the participants were obese; however, it is not reported how many of these were recruited from the weight loss clinic. Those who were already enrolled in weight loss programs may be more likely to have prior nutrition education, greater desire to change eating behaviors, and potentially have other psychological obesity related determinants.

Other questionable design elements in this study included serving methods and time requirements for the meal. Participants were instructed that they could select as much food as they wanted, but that no seconds were permitted. One potential problem with this is whether or not the foods being served were familiar or desirable to the participants. It is not clear that the buffet style items were labeled or explained to participants. This may have accounted for an unexpected increase in broccoli au gratin being selected by those who received the portion plate. The inability of participants to return for more or different food may have influenced their serving amounts to compensate for unknown food satisfaction. Participants were also required to remain at the table for the entire dining session, which was reported to have lasted one to two hours. Since there were two dining sessions, it is unclear whether both lasted the same amount of time or if this inconsistency could have created further variables. Being required to stay at a table for extended periods of time may have also contributed to participants finishing more from their plates. According to the article, factors that may have been at play include boredom, social awkwardness, or return of appetite.[46]

This study was unique in its attempt to evaluate a portion plate for children and include those children in the design of the plate. However, larger and more controlled sampling is needed to be able to better test whether using the plates has an effect on behavior. Larger sample numbers would have also allowed for testing of the second hypothesis, in order to determine if the creative elements of designing the portion plate played a part in their behavior changes using the plate.

Dance

Dance was a third type of art incorporated into nutrition and health behavior education intervention. Multiple studies existed that used dance to increase physical activity, but did not include a nutrition component. For this reason, those studies were left out of this review. Three studies did use a nutrition component along with dance.[44,45,49] However, in all of these studies dance was used only as a form of physical activity, and was not integrated into the nutrition education or healthy eating behavior messages. No other creative components were used in these studies and thus they do not qualify as art-based interventions. While they do not demonstrate the same participant creativity level being addressed in the other reviewed studies, they are all examples of the multicomponent obesity prevention model. Because none of these addressed the specific role of dance in moderating the effects of their programs, they add to the apparent gap in literature for measuring artistic components independent of other program components. This and other gaps will be further addressed in a later section.

Level of Involvement

The level of participant engagement varied within all types of art. The level of creative involvement of the participants varied greatly across studies. Two of the studies, Perry et al 2002[51] and 2004,[44] did not have any subject participation in the actual art component. Examples

of this minimal creative involvement include dancing for physical activity[45,49] or viewing the art of others.[47] Examples of more highly involved activities include drawing and creating their own artwork,[47,48,52] or writing and performing their own nutrition focused theater performance.[43,47,48,50] Determining a distinct scale or ranking of involvement between these different experiences is highly subjective, and would require more information within the literature on each study's specific art activity and goals related directly to the art component.

Research Design

It is difficult to determine if the involvement levels made a measurable impact on the outcomes of the interventions, because many of the studies did not include control groups in the research design. Of the 5 studies that used control groups (Colby et al 2007, Neumark-Sztainer et al 2009, Bohnert et al 2011, and Olvera et al 2010, Perry et al 2004),[43,45–47,52] only Colby et al 2007 and Neumark-Sztainer et al 2009 use a control group to isolate the art activity as an independent variable. Colby et al 2007 used a control group that received no intervention in statistical analysis of dietary behavior outcomes.[43] The study reported positive dietary behavior results for those who participated in the theater-based intervention. Bohnert et al 2011 also attempted to measure differences between groups (those who received the art intervention and those who did not) with regard to their use of the portion plate at mealtime; however, the small sample size of four in each of the four arms did not allow for any statistical analysis.[47] Neumark-Sztainer et al 2009 was able to isolate participant art involvement level by having the control group perform a prepared script, instead of one based on their nutrition education and beginning theater exercises. No significant difference was found between these two groups in behavior change. The intervention was effective in leading to increased awareness of need for behavior change, but not powerful enough to lead to actual behavior change.[46]

Gaps in Current Research

One of the main areas contributing to gaps in the research is study design. In the compiled research, there is a noticeable lack of rigorous RCT study designs. Most of the studies did not use control groups. The use of controls and multiple arms would allow for better variable isolation and help reduce confounders. The use of a multi-component model warrants the need to isolate for specific components. Small sample sizes are also a current limitation. The sample size and recruitment inclusion factors make significant results hard to identify, and limit the generalizability of any findings. Short follow-up periods were seen on all of the reviewed studies. The longest follow-up used in the studies was four weeks. This short timespan makes it impossible to measure long-term changes along with still making it hard to identify meaningful short-term behavior changes in subjects.

A majority of the studies used theater as their creative art form for their intervention. While dance did not demonstrate much promise for nutrition education integration, the visual arts are currently underrepresented. The potential strength of visual arts over theatrical interventions is that after the program has ended, paintings, drawings, or sculpture can be taken home. With the exception of those programs that videotape their performances (none of the included studies did this), there is no tangible *souvenir*. Further research is needed to test whether this difference would impact program outcomes and outcome sustainability.

Conclusions

The reviewed literature supports the theory that art may have some added benefit to nutrition intervention programs, but that it cannot be determined if these programs can lead to lasting behavior changes. Creative involvement does serve to entertain and engage children

participating in programs such as these. Maintaining the attention span of a child is important to ensure proper program implementation and fidelity. As individuals learn differently, programs that use multiple types of learning have also been shown to reach a broader audience. While knowledge does not lead directly to behavior change, the resulting increases in awareness of the need to change, or desire to change, do lie on the causal path, according to Stages of Change theory[24]. The creative process used in art-based programs may foster a deeper and longer lasting understanding of the nutrition messages. Childhood obesity rates may have plateaued for now, but it will take all of our prevention efforts to produce a downward trend, and eventually a cure.

CHAPTER 2: MANUSCRIPT

My Painted Plate: Art Enhances Nutrition Education with Children.

Background

With the on-going childhood obesity crisis,[53,54] there is a need for effective childhood nutrition education programs. Limited resources and funding make it imperative to identify components of nutrition education programs that are effective in creating positive outcomes. Art is one component that has been included in some nutrition education programming with children. Differing types of art, including dance,[45] theater,[43,46,50,51] and visual arts,[47,48] have been used with varying levels of successful outcomes.

Nine studies have been identified that used art to specifically influence child dietary behaviors.[43–51] Of those nine studies, dietary behavior changes were reported by five; one of which included dance,[45] three included theater,[43,44,51] and one used visual arts.[48] The study that used dance had a weekly structured group aerobics class that incorporated salsa dancing along with other sports, nutrition lessons, and behavioral counseling, to increase physical activity and address healthy eating behaviors with Latino mothers and daughters.[45] The authors reported trends from pre/post reported intake that indicated reduced intake of high-fat foods and increased consumption of fruits and vegetables by the daughters. Of those studies involving theater, one was a multi-component school lunch-based intervention, where one of the booster events involved a theater production. This study found that the intervention schools significantly increased students' total fruit intake, as measured by lunch observations, and that verbal encouragement by food-service staff was associated with the outcomes.[44] However, the theater component was only a minor part of the overall intervention, and no conclusions were made about its impact on the outcomes. The two other interventions that used theater as a primary

component reported increases in nutrition knowledge in addition to increased fruit and vegetable consumption.[43,51] Only one used a control group for comparison.[43] This study targeted the children of Mexican American immigrants, and used participation in the development of a theatrical play to address the children's views about the traditional Mexican diet (beans, fruits, and vegetables), as compared to the Americanized diet (hotdogs, pizza, hamburgers, and French fries). The intervention was effective in increasing all three components of the Knowledge Attitudes and Behaviors (KAB) model, however its culturally-specific focus limited the generalizability of the findings.

Even less is known about the potential effects of visual arts. The only study that used visual arts created by children was a pretest/posttest pilot study consisting of 12 alternating sessions (six nutrition lessons with taste tests and six art lessons).[48] The six visual arts workshops were led by professional artists of Studio in a School,[55] using a variety of media including pastel drawing, pen and ink work, and watercolors. Over 900 children completed the program and the 12-question pretest/posttest. Results showed increased knowledge, positive attitudes, and reported fruit and vegetable intake. However, there was no control group, leading the researchers to conclude that the program was successful, but further testing was needed to confirm results. The limited, but successful existing research in the field of nutrition and art with children warrants further examination.

Many nutrition education programs currently use visual art activities such as drawing on MyPlate coloring pages or paper plates.[56–61] However, these activities have not been examined for their impact on the children's learning. Although unrelated to nutrition education, visual art in the field of childhood education has been shown in to increase learning, cognitive function, memory, and have lasting positive effects in all stages of life. [35–37,62] It is unknown if these

benefits occur with nutrition education, and if the level of impact varies by level of user involvement or type of art. The purpose of this study was to determine the impact of including art as a component of a nutrition education program and intensity levels of this component on children's nutrition knowledge, self-efficacy, and dietary behaviors.

Methods

This study was conducted using a randomized cluster control trial design and was based on the Knowledge-Attitude-Behavior (KAB) model. The KAB model is often used in nutrition education[23,24] and self-efficacy is frequently used as a measurement for attitude with this model.[24] While education alone may not lead to behavior change, knowledge and self-efficacy have been shown to be potentially powerful mediating variables influencing healthy behavior changes.[24,28–31]

Fifteen summer camps were contacted via phone calls and emails for potential recruitment. Camps were randomly assigned to receive one of three possible interventions (Table 1). Two of the camps were different locations of the same camp (camp A and camp B), and were grouped together during randomization due to potential participant interaction. The largest camp was divided into two class sessions of older and younger children, based on how the camp's rotation system was set up, but was grouped as one arm during randomization. Camps were randomly assigned with camp A (n=6), camp B (n=25), and camp C (n=20) assigned as control, camp D (n=26) and camp E (n=28) assigned as standard arm, and camp F (n=62) was assigned as the enhanced art arm. All children, ages 8-12, attending the camps were eligible for the study. Due to low parent involvement and expectation of returned papers described by the camp directors, the parents were provided with an opt-out consent process. A

description of the study and information on the opt-out process were provided to parents at the camp registrations.

Table 1. Randomly Assigned Study Arms and Lesson Organization

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Arms	Control Arm	Standard Arm	Enhanced Arm
Camps	Camp A (n=6) Camp B (n=25) Camp C (n=20)	Camp D (n=26) Camp E (n=28)	Camp F (n=62)
Total N	n=51	n=54	n=62
Lessons Components (60 minutes total)	30 minute Nutrition Education 30 minutes non-nutrition related art projects	30 minute Nutrition Education 30 minutes drawing on paper plates	30 minute Nutrition Education 30 minutes painting ceramic plates
Number of Lessons		6	
Days per week		2	

Children from summer day camps in the Knoxville area participated in six nutrition education classes over three weeks. Each week there were two one hour classes. This three-armed intervention study included control groups, standard art groups, and enhanced art groups. Participants from each group received identical nutrition education instruction. Nutrition education instruction occurred in the first 30 minutes of each class, and participants engaged in art activities in the second 30 minutes of each class. Art activities were time matched, but varied in content by group. The control arm received non-nutrition related art lessons. Their art was kept on display at the camp until the post assessment when they were allowed to take home their artwork. The standard arm received basic nutrition-related art and drew MyPlate meals on paper

plates. Their art was also kept on display at the camp and returned to them after the post assessments. For a greater degree of art intensity than the standard arm, the enhanced arm was given ceramic plates to paint, outlined with the MyPlate food group sections. By the end of the three week program, each participant in the enhanced arm that completed the full program painted a set of six dinner-sized plates. The plates were fired by researchers and returned to participants after their post assessment.

To control for the potential influence in the enhanced arm of receiving plates on the follow-up assessments, one camp from each of the control and standard arms was selected to receive pre-painted plates after their post assessment. The plates were painted by adult volunteers and designed to resemble a set of six plates that children in the enhanced arm group painted. All procedures were approved by the University of Tennessee Institutional Review Board.

Attendance was taken at the beginning of each lesson. Assessments took place prior to the first lesson, after all six lessons (post assessment), and then again two weeks after the post assessment, and included a survey and a recall of the previous night's dinner meal. The survey included demographics, nutrition knowledge, food attitudes (self-efficacy), and dietary behaviors. The nutrition knowledge section of the survey was comprised of the *What Do You Think?* Questionnaire.[63] The dietary attitudes and behaviors were assessed using the *Coordinated Approach to Child Health (CATCH) Evaluation Tool*.[64,65] This group of questions measured the intake of certain foods the previous day, attitudes towards certain healthier foods, and self-efficacy. Evening meal recalls (EMR) were conducted with each child individually using the multiple pass method[66,67] to determine the child's adherence with MyPlate recommendations.

Four questions were added to the post assessment data collection. These questions used a five-point, Likert-like scale "smileyometer"[68] modified from the Intrinsic Motivation Inventory[69]. The four questions asked participants to identify their level of agreement with the provided statements. The five choices were "not at all true", "not very true", "somewhat true", "true", and "very true". The questions asked about the child's enjoyment of the nutrition part of the My Painted Plate program, their desire to learn more about nutrition in the future, if they liked their lesson leaders, and their enjoyment of the art part of the My Painted Plate program. At the follow-up assessment, participants who received ceramic plates at the post assessment were also asked if they had used their ceramic plate the night before.

Analysis

Children who did not attend four or more of the lessons (n=80) were not included in the data analysis and were classified as non-completers, along with those who did not attend the post assessment and/or follow-up assessment. The nutrition knowledge, self-efficacy, and behavior survey and demographic questionnaire, plate use, and smiley questionnaire data were entered into IBM's Statistical Package for the Social Sciences (SPSS) Version 22.0[70] *by trained volunteers. Dietary intake data (EMR) were collected and analyzed using Nutrition Data System for Research software version NDSR (2013), developed by the Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN.*[71] A modified version of the University of Minnesota's Nutrition Coordinating Center Food Group Servings Count System, removing fried fruits and vegetables, was used to determine adherence to MyPlate by each food group (dairy, vegetable, fruit, protein, and grain recommended intakes for children based on the national school lunch minimum requirements for each food group[72]).

Individual repeated measures ANOVAs were used to test for changes in nutrition knowledge and self-efficacy, over all three time points, and by intervention arms. Data were then split by arm, and repeated measures ANOVA was used to assess changes over time in each group. Pairwise comparisons were then run to identify differences by time point. An independent sample t-test was conducted to see if the changes in scores differed for the enhanced and standard arms.

Results

Six summer camps agreed to participate in this study. The directors from five of the six camps self-identified the camp as primarily serving children from predominately lower income households and all six camps were low cost (≤$35 for the summer), offered subsidies for qualified families, and offered free lunch to their campers.[73–75]

Of the 167 participants originally recruited at baseline, 69 completed the study and all assessments (completers), and 98 did not complete the study and all of the assessments (non-completers). No differences for any measures were found in baseline measurements between completers and non-completers. Demographic characteristics of the participants are shown (Table 2). No differences were found between the groups at baseline for race or age. Differences were found to be significant by gender. These differences were statistically significant as assessed using Chi-Squares analysis (χ^2=8.217, df=2, p=0.016).

Table 2. Demographic Characteristics of Participants by Study Arm

Table 2. Demographic Characteristics of Participants by Study Arm

Characteristics	Control Arm (n=23) Mean ± SD	Standard Arm (n=18) Mean ± SD	Enhanced Arm (n=28) Mean ± SD	Total (n=69) Mean ± SD
Age, y	9.1 ± 1.0	9.7 ± 1.6	9.8 ± 1.3	9.5 ± 1.3
	n (%)	n (%)	n (%)	n (%)
Sex*				
Male	14 (60.9)	12 (66.7)	8 (28.6)	34 (49.3)
Female	9 (39.1)	6 (33.3)	20 (71.4)	35 (50.7)
Race/ethnicity				
Black	13 (56.5)	6 (33.3)	8 (28.6)	21 (30.4)
White	7 (30.4)	10 (55.6)	15 (53.6)	38 (55.1)
Other	3 (13.0)	2 (11.1)	5 (17.9)	10 (14.5)

*Statistically significant differences existed by gender.

Nutrition knowledge

Nutrition knowledge was measured using the cumulative score of the *What Do You Think?* Questionnaire.[63] Results for the three arms at baseline, post, and follow-up are presented in *Table 3* and *Figure 1*. Significant differences between time and group were found [F(4,130)=3.213, p=.015]. No change in nutrition knowledge occurred over time for control arm between baseline and follow-up (p=0.149). However, nutrition knowledge significantly increased for both the standard (p=0.026) and enhanced art (p=0.013) arms of the study from baseline to follow-up. The standard arm significantly increased from baseline to post assessments (p=0.006) and marginally increased from baseline to follow-up (p=0.067). No difference for the standard arm was found between the post and follow-up assessments (p=0.386). Pairwise comparisons for the enhanced arm showed a statistically significant increase in nutrition knowledge between baseline and post assessments (p=0.004), with no difference between post and follow-up assessments (p=1.000). The knowledge increases from baseline to

post remained statistically significantly increased from baseline to follow-up (p=0.006). Independent sample t-test revealed no differences between the standard and enhanced groups (p=0.607).

Table 3. Repeated Measures ANOVA Comparison of Mean Nutrition Knowledge Scores by Intervention Arm and Time Point

Table 3. Repeated Measures ANOVA Comparison of Mean Nutrition Knowledge Scores by Intervention Arm and Time Point

Time Point	Control Mean (Std. Deviation) n=23	Standard Mean (Std. Deviation) n=18	Enhanced Mean (Std. Deviation) n=28	Total Mean (Std. Deviation) n=69
Baseline	18.7 (4.6)	20.7[ab] (4.8)	17.4[cd] (6.9)	18.7 (5.8)
Post	18.3 (5.5)	23.5[a] (4.8)	20.6[c] (6.2)	20.6 (5.9)
Follow-up	16.2 (6.6)	22.8[b] (5.9)	20.6[d] (7.1)	19.7 (7.1)

[a]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to follow-up assessment, determined by repeated measures ANOVA.
[b]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to post assessment, determined by repeated measures ANOVA.
[c]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to follow-up assessment, determined by repeated measures ANOVA.
[d]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to post assessment, determined by repeated measures ANOVA.

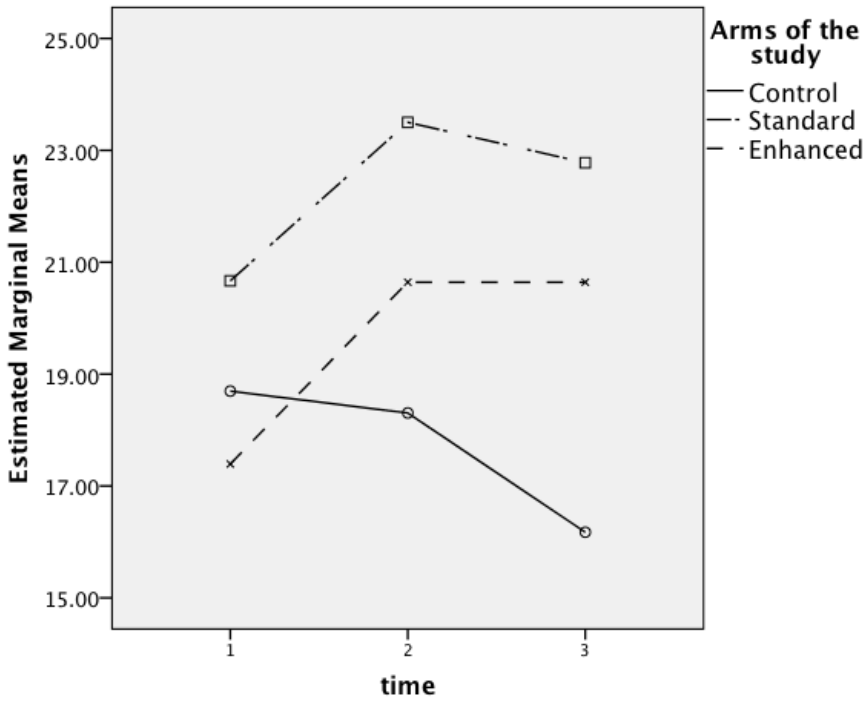

Figure 1. Changes in Nutrition Knowledge From Baseline to Follow-Up

Self-efficacy

Results for the three arms at baseline, post, and follow-up for self-efficacy are presented in *Table 4* and *Figure 2*. The interaction by time and intervention arms approached significance for self-efficacy [F(4,130)=1.958, p=0.105]. It appears that the enhanced group may have had improvement in self-efficacy with an increase of 5.4 points (19.2±5.9 at baseline to 24.6±6.3 at follow-up), while the other two groups improved by less than 2 points each. However, differences between groups were not statistically significant. Statistically significant increases were only found in the overall time effect for the three arms [F(2,65)=4.585, p=0.014]. Pairwise comparisons by time were run to compare differences in self-efficacy between the time points. Significant increase in self-efficacy occurred for all three groups between baseline and post assessments (p=0.047), with no change from post to follow-up (p=0.144). The self-efficacy

scores for all three groups remained high at follow-up to maintain statistical significance between baseline and follow-up (p=0.003).

Table 4. Repeated Measures ANOVA Comparison of Self-Efficacy Mean Scores by Intervention Arm and Assessment Time Point

Table 4. Repeated Measures ANOVA Comparison of Self-Efficacy Mean Scores by Intervention Arm and Assessment Time Point

Time Point	Control Mean (Std. Deviation) n=23	Standard Mean (Std. Deviation) n=18	Enhanced Mean (Std. Deviation) n=28	Total Mean (Std. Deviation) n=69
Baseline	22.0 (5.7)	19.6 (5.2)	19.2 (5.9)	20.2 (5.7)[ab]
Post	22.7 (5.7)	19.3 (5.7)	23.4 (6.7)	22.1 (6.3)[a]
Follow-up	23.1 (6.1)	21.0 (5.7)	24.6 (6.3)	23.2 (6.2)[b]

[a]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to post assessment, determined by repeated measures ANOVA.
[b]Significant changes (p<.05) in the mean score for nutrition knowledge from baseline to follow-up assessment, determined by repeated measures ANOVA.

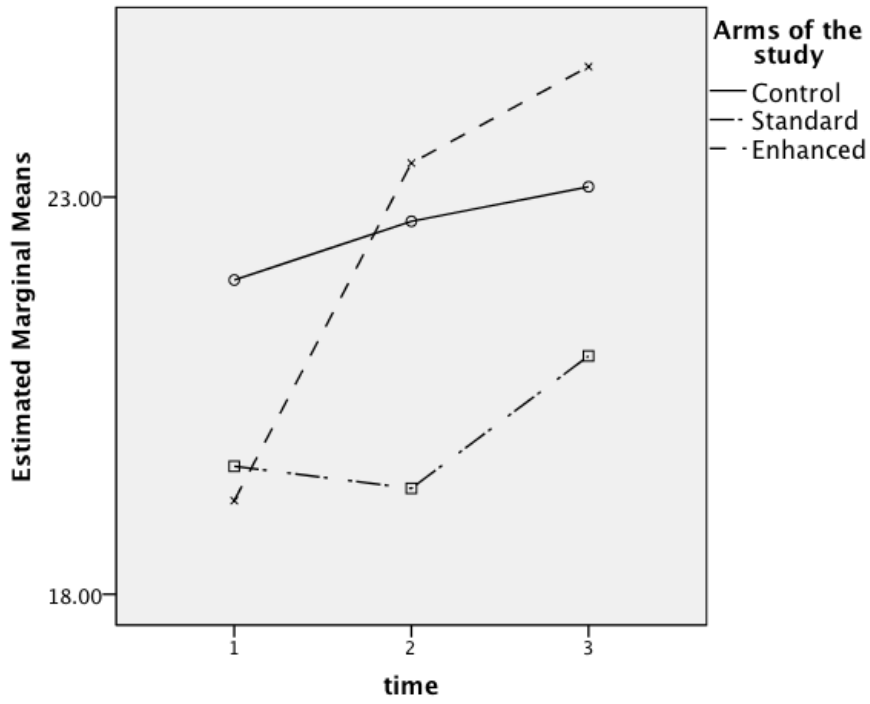

Figure 2. Changes in Self-Efficacy From Baseline to Follow-Up

Dietary Behavior

Dietary behaviors were measured using the CATCH Evaluation Tool constructs and the EMR. There were no differences found between groups for any of the measures. In addition, no changes were found by time for current dietary behaviors.

Plate Usage

Half of the participants in the control arm and standard arms received a pre-painted plate. Of those who received a plate in the control (n=13) and standard arm (n=11), 23.1% of the control and 27.3% of the standard reported using their plate the night before the follow-up assessment. The participants in the enhanced arm all painted their own plates and 62.1% reported having used their plates the night before the follow-up assessment. Chi-Square analysis was conducted to assess for differences between plate use in the three arms (χ^2=7.325, df=2, p=0.026). Those who painted their own plates were significantly more likely to report that they used their plates at dinner the night before the follow-up assessment**.**

Program Enjoyment

The majority of participants (89.8%) said that they liked their nutrition lesson teacher, 76% reported wanting to learn more about nutrition in the future, 92.7% reported enjoying the nutrition lessons, and 95.6% liked the art part of the My Painted Plate program. No differences in responses to these questions were found between the arms of the study.

Discussion

There were significant increases in knowledge for all those who received nutrition-related visual art regardless of intensity of visual art. Both those who drew on paper plates and those who painted on ceramic plates appeared to receive the same benefits from the art activity. The control group was time-matched for the art activity, thus demonstrating that the integration of visual art with the nutrition lesson increased knowledge, not engaging in the visual art alone. Other studies have used participatory learning components to enhance their nutrition education outcomes. Some of these nutrition-related activities have included video games,[76] board games,[77] and gardening activities.[78] While these interventions were able to show improvements in nutrition knowledge, the intrinsic value of children creating their own art separate from nutrition education may make it a component worth incorporating. Art is also universal and can be accessible to all depending on its form. Since both the standard and enhanced arms received nutrition knowledge and self-efficacy benefits, both forms of art were effective. Neither the intensity level nor the expense of the art materials had a different effect on the nutrition education benefits. The gains in nutrition knowledge for both the standard and enhanced arms were also maintained two weeks after the post assessments. The findings support those of other previous studies[43,48,51] that nutrition education and the arts can improve nutrition knowledge. However, this study went further by showing that visual art specifically may be effective in improving nutrition knowledge among study participants.

Children who painted their own plates in the enhanced arm of the study were significantly more likely to report that they used their plates the night before the follow-up assessment. Children who create their own artwork may feel a sense of accomplishment and pride in their work.[79] The children who painted their own plates may similarly have more of an

emotional connection to the plates and incentive to use them at home than those who received the pre-painted plates. Their personal artwork may then aid in the memory stimulation benefits associated with children's art.[80] When asked about their plate use from the previous night, some children reported having used their plates on at least one occasion between the post and follow-up assessment, but not the night before the follow-up. Some children also told volunteers that they were saving the plates to be given as gifts for a family member's upcoming birthday or holiday. Two children mentioned being in the process of moving and not having unpacked the plates yet. The limited time between post and follow-up may not have been sufficient to see changes in knowledge, attitudes, or behaviors resulting from having and using the plates at home.

This study helps validate the use of art in nutrition education, which is especially important given the current childhood obesity crises. Limited funding and resources for nutrition education programs make it imperative to identify components of nutrition education that are more likely to result in positive outcomes. Nutrition-related art is one component that appears to have the ability to increase children's nutrition knowledge gains at relatively little added cost. This study demonstrates that both low cost arts, like coloring, and higher cost arts, like painting ceramic plates, can increase knowledge gains.

Limitations

The high attrition rate is one major limitation of this study. A conservative definition of non-completers, i.e., participants who did not complete all assessments or missed more than two classes, was used because of the amount of information covered at each lesson, and to ensure that those who were included in the data analysis had received more than half of the provided

information. Those children who did not attend at least four of the sessions could have missed learning about three out of the five MyPlate food groups, potentially pulling the average knowledge gains down. Another consideration for choosing the two-lesson limit was that missing two lessons or less would still allow for enhanced arm children to paint an extra plate for a lesson they had missed. It was determined that no more than two plates would be able to be completed in one thirty-minute art session. Absenteeism from any class was caused by a number of factors including family trips, being enrolled in other day or weeklong camps at the same time, injury or illness, moving, and doctor's appointments, as reported by participants and the camp directors. This attrition rate is similar to other summer day-camp based interventions.[81,82] The resulting high dropout or non-completer rate greatly reduced the sample size and may have contributed to some of the findings not reaching statistical significance between groups.

The limited number of sessions being taught by this study made attendance at the sessions even more important. Other similar nutrition education programs for this age have used a minimum of 12 lessons, with similar nutrition knowledge findings and additional behavior changes. Other successful nutrition programs have been implemented in-school and after-school and taken place over the entire school year.[83,84] The lengths of these intervention programs may have reduced the impact of student absenteeism from lessons, as none reported this as an issue in their studies. The summer camp-based design of this study limited the number and length of lessons. However, the ability of this study to still increase nutrition knowledge, with the limited time frame and the potential of participants missing up to two lessons, demonstrates that four to six nutrition and art lessons are sufficient to increase nutrition knowledge and self-efficacy. More time and lessons may be required to change dietary behaviors.

The dietary behaviors questionnaire was chosen because it was approved by the National Institutes of Health and used by the CATCH Curriculum. It has been approved for use in this target population. After implementation a number of limitations were identified with using the CATCH Evaluation Tool. Three children identified themselves as vegetarians and were unsure how to answer the questions pertaining to preferences on meat. Four children reported not being able to drink milk and using soymilk or rice-milk at home. They found it difficult to answer the questions pertaining to preferences on types of dairy. At least one measurement tool for older age groups has included additional questions, which address these dietary issues, but was not previously validated for the age group used in this research study.[85]

Using recall methodology for evening meal consumption introduced the potential of recall bias and/or social desirability bias. Further limitations of the evening meal recall component included children skipping dinner, children telling "stories" or trying to "trick" the volunteer by providing false information, and children reporting snacking instead of eating a main "dinner meal". Children who reported not eating dinner the night before gave a variety of reasons including not being hungry, not being home for dinner, having eaten a larger meal earlier in the day, and not having food available. These issues with recall and social desirability biases are commonly reported in dietary assessments with children.[86–88]

Demographic differences at baseline were found for age to be statistically significant, however their starting knowledge levels were not. One previous study that took place in Seoul, Korea did find stronger associations for dietary behaviors and nutrition knowledge among girls than for boys.[89] However, no differences were found by gender in any of the measures in this current study. While some suggest that same-sex classrooms and groups aid in the learning

environment,[90–92] a few studies have shown that either same-sex classrooms do not produce differences in learning outcomes, or that mixed-sex learned better.[93,94] According to the National Education Association, the benefits of same-sex learning environments are still up for debate.[92]

Implications for Future Research

This research supports the concept that changes in nutrition knowledge alone do not necessarily equate to changes in behavior.[23,28,95] However, it has been proposed that changes in knowledge are often an essential component in the behavior change process.[24,28–31] This study does indicate that art with a nutrition message is not the defining element that would create behavior change, as the nutrition education approaches used in this study were not effective in changing behavior (as evidenced in the lack of behavior change in the control group). However, this does not preclude nutrition education used in other settings from functioning in the behavior change process. The lack of difference in behavior change found in this study may have been due to weaknesses in the nutrition education curriculum or delivery, and not because of art's lack of influence.

Since changes in knowledge may be important when individuals are trying to change behavior,[29] art may still play a role in promoting successful behavior change through its ability to promote greater changes in knowledge. Thus, if art is used in conjunction with effective nutrition education approaches, the inclusion of art may function to produce greater improvements in behavior, than if the effective curriculum is used without art. This theory needs to be tested in a longer-term nutrition education program using art with a curriculum that has already been found to be effective in changing behavior.

CHAPTER 3: EXPANDED METHODS

Project Overview

The My Painted Plate project was developed to address the current research gap on the use of visual arts and different levels of intensity to enhance the effects of nutrition education with children. The program sought to determine if the inclusion of visual art related to nutrition could increase nutrition knowledge, self-efficacy, and behavior change over that of nutrition education alone. In addition, this study assessed for differences between lower and higher intensity of art activities.

All procedures were approved by the university's Institutional Review Board (IRB #FWA 9502).

Recruitment

Fifteen Knoxville summer camp locations were targeted for potential recruitment as sites for the My Painted Plate study. Initially camps were identified through multiple means. A preliminary Google search for "summer day camps in Knoxville, TN" provided three potential camps that fit the initial criteria of offering daylong camp five days per week for a minimum of four weeks. Fellow researchers familiar with the area suggested camp providers that they had worked with before for programming. These suggestions included thirteen camps, which were then looked at for their distance to the University and previous programming relations. Three of these camps were removed from the initial list due to either being farther than 25 minutes from the university, or having presented past issues for researchers. The primary researcher made first contact with the camp directors via phone call and or email. Camps were further recruited based on their interest, proximity to the University of Tennessee, age of children, English speaking

attendees, estimated participant enrollment, day camp schedule, and availability to accommodate two lessons per week and three assessment days. A range for desired participation for each study arm was set between 30 and 80 participants, with an overall study capacity of 180 participants. These limits reflected budgetary and personnel constraints, and maintained adequate power for statistical analysis. Six of the seven summer camps matched the selection criteria and agreed to the program. These camps were confirmed and scheduled for classes and assessments. The seventh camp was unable to participate in the program due to extensive scheduling conflicts. The six chosen camps were asked to provide letters of support for the My Painted Plate program for the IRB expedited review.

Request for waiver of signed parental consent was approved of by the IRB at the University of Tennessee. The primary reason for this request was concern expressed by camp directors for the return rate on forms sent home to parents. The target population was primarily low-income children, and many of the camps were free or extremely low cost. Camp directors reported rarely seeing parents due to work schedules or other circumstances. The request was granted for these reasons and because the research study posed minimal risk to participants while providing a stimulating, fun, and educational experience for these low-income children at their summer camps.

Randomization

Two of the camps were different locations of the same camp and were grouped together for randomization due to their small size and potential participant interaction. The largest camp was divided into two class sessions of older and younger children based on how the camp's activity rotation system was set up. The camp divided their children into four age groups, and

rotated the groups through different activities (such as gym time, lunch, crafts, and outside time) throughout the day in one-hour increments. Due to the size of this camp, the entire camp was counted as one arm for randomization. Camps were randomly assigned to one of the three study arms by drawing names out of a hat, with camp A (original estimate=15) (n=6), camp B (original estimate=15) (n=25), and camp C (original estimate=30) (n=20) assigned as control, camp D (original estimate=20) (n=26) and camp E (original estimate=30-40) (n=28) assigned as standard arm, and camp F (original estimate=60-80) (n=62) was assigned as the enhanced art groups. Children's registration at each camp proceeded based on the camps' established policies and procedures. Each camp provided a letter describing the study and the opt-out process to parents prior to the start of camp (Appendix B). Parents were also provided with a brief demographic questionnaire and photo release form when they registered their child. Demographic information collected included child's age, gender, race, parent's education level, income, and number of household occupants (Appendix C). Parents were asked to complete and return the demographic questionnaire and photo release form prior to the start of the camp. However, enrollment into the study was not contingent on the parent completing the demographic information form or photo release form. No parent requested to sign the opt-out form, but if they had, an additional copy of the document would have been provided to the parent for their records, and their child would still be able to participate in the nutrition education and art program without their data being used for the study.

Curriculum Development

The My Painted Plate curriculum was developed using the CATCH curriculum[96] and the www.ChooseMyPlate.gov website[97]. Six lessons were designed to focus on each of the different

MyPlate food groups and fit in the 30-minute time frame designated for nutrition education. Lessons covered the "Key Consumer Messages" developed by MyPlate which include: make half your plate fruits and vegetables, make at least half your grains whole grains, switch to fat-free or low-fat (1%) milk, vary your protein food choices, and cut back on sodium and empty calories from solid fats and sugars. Handouts for each lesson were chosen from USDA materials available online and designed for the target age group. The lessons were designed to be both interactive and informative and to incorporate all of the basic learning styles.[98,99] Each lesson also touched on how the food group focused on that day fit in with the CATCH theme of "Slow Go Whoa" foods.[96,100] A detailed list of the lesson components and lesson materials are provided in Appendix D.

Pre-Painted Plate Ceramic Procedures

Since participants in the enhanced group received a set of the six plates they painted during the classes to take home and keep, pre-painted ceramic plates were distributed at the end of the 6-lesson nutrition education program (after participatns completed the post assessment) to the *control* and *standard art* arms of the study, to allow comparison between groups at follow-up assessments and control for the influence of receiving painted plates. To create the prepainted plates, bisqueware ceramic plates were painted by a team of trained graduate and undergraduate nutrition students. Stencils of the MyPlate logo were made and Mayco Designer Liner: black was used to outline the MyPlate sectons onto the bisqueware ceramic plates. Twenty nutrition undergraduate and graduate students painted the plates using templates created by the primary researcher (Appendix E) and Mayco Stroke and Coat Kit #1. So as not to provide missinformation visually represented on the plates, templates were designed using the MyPlate

guidelines for 9-17 year olds. Foods included were based on a 2200 kcal/day diet which is indicated by the USDA as an appropriate calorie intake level for lightly active 9-17 year old children.[101,102] Portions for each MyPlate food group were chosen based on the MyPlate Sample Meal Plans (Meal Plan C).[103] Input was provided by 10 Registered Dietition Nutirtionists, and changes were made to the templates based on the feedback. The student painters were given printouts of the templates and were shown how to paint their assigned sections of the plates. To achieve the large volume of pre-painted plates, 60 plates were painted each week over six weeks. The primary researcher glazed (Mayco NT-CLR Clear One) and fired the plates throughout the six-week process. This was done to ensure availability of the kiln when the child-painted plates needed to be fired each week during the summer program. Kiln firing were carried out at Mighty Mud Ceramic Supplies & Studios, Liza Moz' Paint Your Own Pottery, Carolyn Cooper, and Arrowmont School of Arts and Crafts. Proper Cone 06-6 firing procedures were used.

Volunteer Training

Assessment Training

Eighteen assessment volunteers participated in three hour training to learn how to complete the assessment process, the evening meal recalls, and the KAB survey (Knowledge, Attitudes, and Behaviors). An emailed copy of the survey and 24-hour recall instructional video,[104] originally created for the Healthy Habits Project and made available on YouTube by the California Academic Media Services, was provided to volunteers prior to the training.

Volunteers were first trained in collecting 24-hour recalls using the multi-pass method in order to familiarize them with the process that would be used for the evening meal recalls (EMR). The multi-pass method of 24-hour recall has been successfully utilized as a dietary

assessment method with XX year olds.[66,67] The following standardized procedures were used: 1) the initial "quick list", participants were asked to report all foods and beverages consumed in the past XX hours; 2) the "forgotten foods list", participants were asked if there were any missing foods or beverages from nine foods categories that are commonly left out of 24-hour recall reporting; 3) the "detail pass", in which probing questions were asked for more detailed information about the food and beverage portion sizes of the reported foods eaten; and 4) the final review of the foods reported consumed and conformation of completeness. The lab volunteers were initially trained as a group on this method. In pairs they then collect 24-hour recalls from each other. The primary researcher and a second previously trained and highly experienced volunteer reviewed all recalls for completeness. Those whose recalls were deemed incomplete were retrained and retested until proficient. Four volunteers required one retraining and successfully passed their retest.

Assessment volunteers were then trained to use the Nutrition Data System for Research (NDSR) dietary analysis software[4] and then put their partner's 24-hour recall into the NDSR system. In order to better understand the type and depth of information that needed to be collected during recalls, volunteers who had not previously worked with NDSR were asked to enter 3-5 previously collected seven day food records over the next 2 weeks. Putting in food records collected by others helped them to identify information or details that are commonly missed during recalls or that would have made data entry easier if present. Figure 3 depicts the volunteer training and designations.

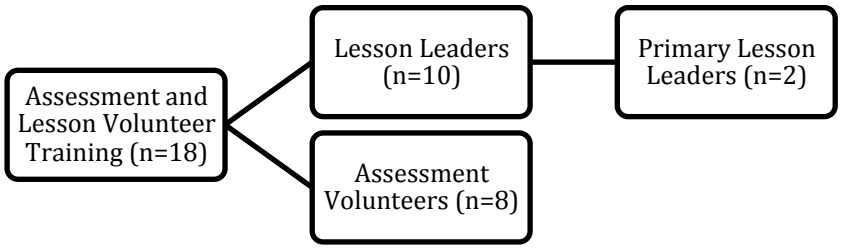

Figure 3: Volunteer Trainings and Designations

Lesson Leader Training

During the last hour of the three-hour training session, the primary researcher reviewed each of the six nutrition education curriculum lessons with the group. Further information on the curriculum development is provided in another section. All handouts and materials were provided to the volunteers. Binders were created for each individual camp containing all handouts, lesson descriptions, class attendance sheets, and additional MyPlate food group resources for the volunteers. Due to the overlapping schedule of the classes at the six different camps, it was not possible for the primary researcher to teach all six lessons at each location. A lesson leader rotation system was developed to minimize differences between the six camps and three arms of the study, and is depicted in Table 5. Ten lesson leaders were selected from those who had attended the Lesson Leader Training session based on their observed teaching abilities and confidence, and individual practice sessions were set up with each of these ten leaders for the lessons they were assigned. From these ten lesson leaders, two were selected to be primary lesson leaders based on their incomparable teaching abilities and leadership skills. These two primary lesson leaders met with the primary researcher, prior to each new lesson, to coordinate teaching styles for continuity. The primary researcher taught a minimum of three lessons and

attended a fourth lesson at each location. Those lessons not taught by the primary researcher were led by one of the two primary lesson leaders with assistance from the other lesson leaders. During the program implementation, weekly group meetings were held with all lesson leaders and helpers to recap experiences from the previous week and review/prepare for the next week's lessons. A pre-prepared example of each lesson's art project for the control arm was shown and the control group art activity process explained to leaders. Descriptions of these art projects are provided in Appendix F.

Table 5: Lesson Leader Rotation System

Arm	Location	1 lesson	2 lesson	3 lesson	4 lesson	5 lesson	6 lesson
Control	Camp A	PR-T	PR-T	PR-A	PLL-T	PR-T	PR-T
	Camp B	PR-T	PR-A	PR-T	PLL-T	PLL-T	PR-T
	Camp C	PR-T	PR-A	PR-T	PR-A	PR-T	PR-A
Standard	Camp D-1	PR-T	PR-T	PLL-T	PR-T	PLL-T	PR-T
	Camp D-2	PR-T	PLL-T	PR-T	PLL-T	PR-T	PR-T
	Camp E	PLL-T	PR-T	PR-A	PR-T	PR-A	PR-T
Enhanced	Camp F	PR-T	PR-T	PR-A	PR-T	PLL-T	PR-T

Figure 2: Lesson Leader Rotation System
PR-T: Primary Researcher Taught; PR-A: Primary Researcher Attended; PLL-T: Primary Lesson Leader Taught. Camp D was split into two rooms after the first lesson to accommodate the number of children. These lessons were taught at the same time and leaders switched each time which room they taught.

Baseline Assessments

Baseline assessments included attaining participant assent, knowledge, attitude (self-efficacy), and behavior survey, and an evening meal recall. All assessments were conducted with a team of lab volunteers maintaining a 1:5 ratio to participants.

The child assent form was read aloud to the group of children at the beginning of the first assessment. Children that wanted to participate were asked to sign/write their name on the assent

form (Appendix G). Those children who did not wish to assent (n=23), were still allowed to participate in all program activities, but their data was not collected for the study.

Nutrition knowledge was assessed at baseline using a pen and paper survey questionnaire developed using the CATCH Kids Club curriculum and validated for this age group, including low-income and minority populations.[105] Self-efficacy and dietary behaviors were assessed using questions from the *CATCH Kids Club Questionnaire (Evaluation Tool)*[65] provided by the National Institutes of Health (NIH) and the Coordinated Approach To Child Health (CATCH) Group. The purpose of this tool was to evaluate CATCH Kids Club programming and was appropriate for use in this study becase the nutirtion curriculum was based on the CATCH program. The tool is available for free from the NIH Curricula and Toolkits website (http://www.nhlbi.nih.gov/health/public/heart/obesity/wecan/tools-resources/curricula-toolkits.htm) and can be completed by children K-5th grade within 15-20 minutes. Instructions for researchers using the tool are also available on this site.[106]

For simplicity, the CATCH Questionnaire and nutrition knowledge survey were combined into one document;it took participants approximatly 20 minutes to complete the surveys(Appendix H). Each participant was assigned a unique participant identification number (PID) to deidentify participants. The list of names and passwords was stored separatly from any participant collected information. Each participant was handed one questionnaire and their PID was written on the front and back. The primary researcher and assessment volunteers explained to participants that this was not a test, there were not right or wrong answers, and that the questnnaire was designed to evaluate the curricula, not them. They were instructed to answer as honestly as possible and that they would have about 20-30 minutes to complete the questionnaire.

Once the questionnaires had been completed, the evening meal recall (EMR) was conducted. Participants were interviewed one-on-one by a trained lab volunteer to collect information about the child's evening meal the night before. Interviews followed the multiple-pass method.[107] A summary sheet of EMR procedures was provided to volunteers to aid with interviews (Appendix I). Answers were recorded on the assessment data sheets to be later entered into Nutrition Data System for Research (NDSR)[108] dietary analysis program. Children who were not being interviewed were supervised by a lab volunteer, and played non-nutrition or art-related games until everyone had completed their assessments.

Control Group Lessons

Six individual basic nutrition lessons were taught using an adapted CATCH curriculum (Appendix D). Lessons were taught two times per week for three weeks. Each lesson consisted of 30 minutes of nutrition education and 30 minutes of a non-nutrition related hands-on art activity. The art was kept and displayed at the summer camp center to allow for a better matched intervention with the standard and enhanced art intervention, since those who painted their own ceramic plates were not able to take home this art until after the sixth lesson. A list of the art activities is provided in Appendix F. At the end of the post assessments, participants were able to take home their art, and one control camp location received a set of six ceramic plates to keep. Only two of the three location received the prepainted plates due to resource limitations. The plates had been painted with different images on each plate of food representations and MyPlate food group sections in a style similar to that of a 10 year old child. Sketches of the six different plate designs are provided in Appendix E. All plates provided were dishwasher safe, microwave safe, BPA free, and ceramic standard 10 inch dinner plates. By giving two control locations

painted plates, differences could be assessed between those who receive plates and those who did not, and controlling for the influence of receiving plates during follow-up assessments between groups. This would allow researchers to determine if any potential improvements found in the enhanced group, above any potential improvements found in the standard or control group, was due to the participants creating the plates themselves, instead of just the influence having plates provided and/or using MyPlate painted plates at home.

Standard Group Lessons

Six individual basic nutrition lessons were taught using the same adapted CATCH curriculum (Appendix D). Lessons were taught two times per week for three weeks. Each lesson consisted of 30 minutes of nutrition education and 30 minutes of nutrition related hands-on art where the participants drew on paper plates what a MyPlate meal looks like. Stencils were created by the primary researcher to aid the children in outlining the correct proportions of the MyPlate sections on their plates. The plates were kept and displayed at the summer camp center to prevent additional nutrition education exposure from occuring in the home environment. The purpose of this was to allow for a better matched intervention with the control and enhanced art intervention. This activity is one typically used in current nutrition education settings.[56–61] At the end of the post assessment participants were able to take home their art and one standard art camp location received a set of six ceramic plates to keep, as discussed in the control group section above.

Enhanced Group Lessons

Six individual basic nutrition lessons were taught using the same adapted CATCH curriculum (Appendix D). Lessons were taught two times per week for three weeks. Each lesson consisted of 30 minutes of nutrition education and 30 minutes of nutrition related hands-on art where the participants painted their own ceramic plates. The children were shown examples of plates painted with foods in each other the MyPlate sections and encouraged to paint their plates to reflect information covered in their nutrition lessons. Pictures of each child's plate were taken pre-firing and displayed at the summer camp center. The purpose of this was to allow for a better matched intervention with the control and standard art intervention. The day after the post assessments, participants received their own six ceramic plates that they personally painted to keep. All plates were dishwasher safe, microwave safe, BPA free, and ceramic standard 10 inch dinner plates. All attendees of the camp who painted a plate received their plates back regardless of their atendance or participation in the study.

Enhanced Painted Plate Ceramic Procedures

While the children painted their plates, volunteers would write the child's name, lesson number, and age group on the bottoms of the plates with Mayco Designer Liner. After each My Painted Plate lesson at the Enhanced arm locations, photographs of the front and back of each plate were taken. Volunteers used hairdryers and fans to dry plates. Once plates were dry to the touch, they were repacked into their individual bubble wrap bags and boxed up. Painted plates were taken by the lead researcher to Mighty Mud to be dip glazed and distributed to the kilns for firing. Printouts of the photographs of the fronts of each plate were displayed at the camp prior to the next lesson.

Lesson Process Evaluation

Lessons were taught by the primary researcher and lesson leaders. The rotation system previously described allowed for lessons to be taught at all six locations without major scheduling conflicts, while providing the same level of education and resources to each class. The primary researcher attended the first lesson led by the lead lesson leaders, before they were allowed to lead a class where the primary researcher would not be present.

Post Assessments

Post assessments took place the week following the 6th lesson. Two of the activities from baseline assessments were repeated: knowledge, self-efficacy, and behavior survey and the evening meal recall. Four questions were also added to the survey for the post assessment. The questions used a five point Likert scale "smileyometer"[68] modified from the Intrinsic Motivation Inventory (IMI)[69]. The four questions asked participants to identify their level of agreement with the provided statements. The five choices were "not at all true", "no very true", "somewhat true", "true", and very true". The questions asked about the child's enjoyment of the nutrition part of the My Painted Plate program, their desire to learn more about nutrition in the future, if they liked their lesson leaders, and their enjoyment of the art part of the My Painted Plate program. Participants who had attended a minimum of four out of the six lessons were still eligible for their data to be used in the study. All children present at the camp on the day of the post assessments were asked to complete the surveys to avoid impressions of unequal treatment. However, only those whose data would be used were asked to give an evening meal recall.

Upon completion of the post assessment, participants were provided with their artwork. The enhanced art arm received the six plates they painted durring their lessons on the following

day to accommodate firing time. One camp location from each of the control and standard art arms was selected, based on participation rates, to also receive pre-painted ceramic plates to take home and keep after the post assessments. Camp A and B had been randomized together and were thus considered one camp throughout the study. This camp was selected to receive pre-painted plates for the control arm. Camp D was chosen from the standard arm to also receive pre-painted plates. The purpose of these plates was to determine if those children who painted their own plates in the enhanced art arm had different knowledge, self-efficacy and behavior outcomes than those who receive plates painted by others and was measured by comparing the post and follow-up assessment data.

Follow-Up Assessments

Follow-up assessments took place two weeks following the post assessment. Two of the activities from baseline assessments were repeated: knowledge, self-efficacy and behavior survey, and the evening meal recall. Participants were also asked at the end of their recall whether they used their painted dinner plates durring their meal the night before, and the answer was marked on their recall sheet. The two camps that did not receive painted plates were not asked this questions at follow-up. Only those children whose data was still eligible to be collected and who had completed the post assessment were asked to complete the follow-up assessment.

Statistics

Children who did not attend four or more of the lessons were not included in the data analysis. The nutrition knowledge, self-efficacy, and behavior survey and demographic

questionnaire, plate use, and smiley questionnaire data were entered into IBM's Statistical Package for the Social Sciences (SPSS) Version 22.0[70].

Paired entry was used when multiple people were available to enter data at the same time. Two trained volunteers sat down at the computer together. One volunteer would read out the answers from the paper questionnaire while the other typed it into the SPSS spread sheet. Once the entire questionnaire was entered, the volunteer who had typed in the answers would read them off from start to finish out loud to the other volunteer. The volunteer with the paper copy would make sure that all answers were read off correctly to double check the entry. Once this process was completed, both volunteers would write their names on the paper questionnaire along with the date of entry.

Double data entry was used when only one volunteer was available at a given time. The first volunteer would enter in the answers from the questionnaire on their own, and then write their name and the date on the paper questionnaire. A second volunteer would then check over the entry on a separate day. If no mistakes were found, the second volunteer would write their name on the paper questionnaire along with the date of their entry. If a single mistake was found, it was corrected and the volunteer would write their name and date on the paper questionnaire. If multiple errors were found, the second volunteer would correct them, mark their name and date on the packet, and mark the sheet for a third person to check the entry. The primary researcher completed the third check of all entries.

Evening meal recalls were entered into NDSR. Two computers were used to accommodate multiple volunteers entering data at the same time. The files were merged together once all assessments had been entered. The meal recalls were entered into NDSR by the person who performed the recall whenever possible. If any person other than the person who

performed the recall entered a recall into NDSR, any questions or clarifications were directed to them. The names of both the volunteer who performed the recall and the volunteer who entered in the NDSR were written on both the paper copy and as a note in the NDSR file. The instructions for entering in meal recall data were provided to volunteers on the Reach Lab Google Drive as well as in a paper copy kept in the lab (Appendix J). Some of the assessment sheets contained items eaten by the children other than dinner such as snacks after or desert. For the purpose of this research project, only those foods directly part of the child's dinner meal were entered into NDSR.

Children who reported not eating dinner were also entered into NDSR. The reason for not eating dinner was entered in as a note if reported. Some of the reasons for not eating dinner reported were not getting home till late, not having food to eat, and not being hungry or having had a large meal before dinner.

NDSR outputs Servings Count (File 08) for each participant were imported into Microsoft Excel for scoring and calculations. A modified version of the NCC Food Group Servings Count System was used to calculate servings of each food group. Modifications to the food group servings count are as follows: fried potatoes (VEG0800) and fried vegetables (VEG0900) were removed from the total servings of vegetables; fried fruit was removed from the total servings of fruits; whole grains (GRW0###) and the subgroups of "some whole grains" (GRS0###) were added together to calculate the percent of total servings of grains that were whole grains; legumes (VEG0700) were included in the total servings of protein; servings of lean protein was calculated by combining all "lean meat" subgroups (M_L0###)(≤10% fat), eggs (MOF0300), egg substitute (MOF0400), nuts and seeds (MOF0500), nut and seed butters

(MOF0600), meat alternatives (MOF0700) and the legumes subgroup (VEG0700); Servings of low-fat dairy were calculated from the "low fat and fat free" subgroup (D_L0###).

An Evening Meal Recall (EMR) score based on a modified Healthy Eating Index (HEI) scoring system was developed to compare the children's evening meals to the MyPlate recommendations. Points were awarded for each of the food group categories based on whether they met the minimum requirements for National School Lunch for that group. Ten points were earned consuming the minimum amount for each of the following: 0.5 cups of fruit, 0.75 cups of vegetables, 1oz of grains, 1oz of protein, 1 cup of dairy. No points were given if the servings of a food group did not meet these minimum quantities. An additional 10 points could be earned for participants consuming any of the following: >0.5 cups of fruit, >0.75 cups of vegetables, 1oz of lean protein, 0.5 cups of low-fat or fat-free dairy, and 50% of their total grains as whole grains. The possible scores ranged from 0-100, with zero being "did not meet MyPlate recommendations at all" and 100 being "met or exceeded all MyPlate recommendations". Scores were calculated in Microsoft Excel and then transferred in to SPSS for analysis.

An alpha level of 0.05 was used for all statistical tests. Individual repeated measures ANOVAs were used to test for changes in nutrition knowledge, each of the CATCH Food Attitudes constructs, each of the CATCH Food Behaviors constructs, EMR score, and each of the individual EMR food groups, over all three time points and by group. A detailed list of the CATCH constructs, questions, and scoring associated with the survey is provided in Appendix K. For those measures where statistical significance was present, data was then split by group and repeated measures ANOVA was used to assess changes over time in each group. Pairwise comparisons were then run to identify differences by time point. Independent sample t-test was run to see if the changes in score differed for the enhanced and standard arms.

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APPENDICES

Appendix A Extraction Data Table

This information was uploaded as an attachment.
Literature Review Extraction Data.pdf

Appendix B Letter Describing the Study and Opt Out

My Painted Plate Project

We are doing a *My Painted Plate Project* this summer at camp. This project is a research study that Abby Forman is conducting as a University of Tennessee Nutrition Department graduate student project. She is studying eating behaviors of children between 8-12 years.

The purpose is to study how to help children make choices about what they eat so that they can have healthy lives. There will be 6 nutrition and art lessons during the camp. Each session will take about 1 hour and will take place at your child's summer camp.

What Will You Be Asked to Do? You will be asked to complete a demographic questionnaire prior to the start of camp and is included in this packet.

What will your child be asked to do? Your child will be asked to complete a 30-minute assessment that includes 20 minutes for two surveys about food and 10 minutes for a short interview about what they eat. Assessments will be at the start of the camp this summer, in the middle of the summer, and once at the end of the camp this summer.

Benefits to Participation Your child will gain knowledge of healthy eating habits and be able to make their own art. Your family's participation in this study may lead to better understanding of the role of nutrition in leading a healthy and happy life.

Risks to Participation There is minimal risk to participating in the study, primarily due to time and inconvenience and would be no more risk involved than participating in other normal summer camp activities.

Program Resources Your child will receive six ceramic painted plates to keep and use at home at the end of the summer camp.

Confidentiality All information that is provided is confidential and protected. All data collected will be kept on the researcher's password protected computer and in the University of Tennessee, Research on Eating and Activity of Community Health (REACH) lab, for up to four years and then destroyed. Not identifiable information will be stored indefinitely in an electronic version accessible to the researchers who are part of the study.

Voluntary Participation in this study is voluntary. If you choose to take part in this study, you may stop at any time. If you choose to stop your child will still be able to continue in the camp lesson activities, but none of their data will be collected or analyzed for the student's project.

Contact Information Contact Abby Forman for questions about the research project at (865) 974-2855, at the University of Tennessee. For questions about your rights as a study participant, contact the Office of Research Compliance Officer at (865) 974-3466.

If you do not want your child to participate in this project, please see your camp leader and sign the opt out form.

My Painted Plate Project.

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Your signature below indicates that you have read, understand the above information, and that you <u>do not want your child to participate</u> in the My Painted Plate Project. You will receive a copy of this form for your records.

_____	_____	_____
Your Printed Name	Signature	Date

_____

Your child's first and last name

Appendix C Child Demographic Questionnaire

Child Demographics Questionnaire
to be Completed by **Parent/Guardian**

Child's First Name: _____

Child's Last Name: _____

Child's gender (circle one): Male or Female

Child's date of birth: _____/_____/_____

Which race/ethnicity best describes your child? (Please check all that apply.)

- American Indian or Alaskan Native
- Asian American
- Black or African American
- Hispanic or Latino American
- Pacific Islander
- White / Caucasian
- Other (please specify)_____
- Choose not to answer

What is the highest level of education you have completed?

- Less than high school
- High School graduate/ GED
- Some college (1-4 years, no degree)
- Associate's degree (including occupational or academic degrees)
- Bachelor's degree (BA, BS, AB, etc)
- Post-graduate course work or degree
- Choose not to answer

What is the approximate average household income? (Please select one.)

- $0-$24,999
- $25,000-$49,000
- $50,000-$74,999
- $75,000 and up
- Choose not to answer

How many individuals live in the household?

_____

Appendix D Lesson Components and Lesson Materials

All listed handouts and additional material were uploaded as an attachment.
Lesson Components and Lesson Materials.pdf

Source: adapted from CATCH curriculum

Note to leaders: use www.ChooseMyPlate.gov food groups pages for big info points.

Lesson 1 (30 minutes): Intro. How do we categorize food?

- (15 minutes) **Welcome to MyPlate**.
  - ❖ HANDOUT: "My Daily Meal Plan"
    - What do all the colors represent?
      - Red: Fruits
      - Green: Vegetables
      - Purple: Protein
      - Orange: Grains
      - Blue: Diary
    - How is MyPlate layed out?
      - Fruits and vegetables are on one side with vegetables being slightly bigger…
      - Fruits and vegetables together make up half of our plate
      - Protein is smaller than the grains section
      - Dairy is shown on the side like a glass of milk
      - What don't you see on MyPlate? Fats, added oils, sugars, and sweets. This is because we want to minimize these througout the day.
    - How do we fit our foods on MyPlate? Children will list out foods to fit on the plate. Have them list them out section by section (about 3 per section).
    - How do combination foods fit? MyPlate **"Deconstruct to Reconstruct" activity.** (Each team of 5 will be given a combo food to list out their ingredients and figure out where on the MyPlate each part goes.)
- (10 minutes) **What is GO SLOW WHOA?** Objectives:
  - Go over the definitions of GO, SLOW, and WHOA food categories.
    - Go Foods: eat almost anytime (most often)—they are lowest in fat, added sugars, and calories.
    - Slow Foods: Eat sometimes (less often)—they are higher in fat, added sugar, and/or calories.
    - Whoa Foods: eat once in a while (least often)—they are very high in fat and/or added sugar, and are much higher in calories.
  - ❖ HANDOUT: "U R What U Eat" (Go Slow Whoa handout with all food groups)
  - Children will practice identifying GO, SLOW, WHOA foods by playing the **SIMON Says GO SLOW WHOA game**.
    - All children will stand up and play as individuals. If they identify a food wrong by doing the wrong "move" they sit down. The last child standing is the winner. Each category has a "move": GO = run in place, SLOW =

zombie arms, WHOA = freeze. When a sign or food picture is held up the children must do the correct "move" for that food's category.

- (5 minutes) **Wrap-up, Review, and What's Next**. Objectives:
  - Review the MyPlate sections.
  - Review GO, SLOW, WHOA definitions.
  - Over the next 5 lessons we will talk about each of the different sections of MyPlate, staring with Fruits and Vegetables.

Lesson 2 (30 minutes): Fruits and Vegetables.

- (15 minutes) **Where do we find this food group on MyPlate?** Objectives:
  - Children will list examples of foods that are in this food group to be written on the board.
  - How much do we need? Serving size and how much each day. (2 ½ cup vegetables, 2 cups fruits) (whole fruits and vegetables are better than choosing juices because the juices don't have the same fiber the whole version does.)
  - What does it mean to "eat the rainbow" and why is it important? Discuss how vitamins and minerals are found in each different color. What do each of these vitamins and minerals do for us?
    - ❖ HANDOUT: "Nutrients"
- (10 minutes) **GO, SLOW, WHOA**. Objectives:
  - Discuss how the foods in this food group can again be categorized as GO, SLOW, or WHOA.
  - Give examples of each category with this food group and then have children think up more examples for the categories. Write their foods in the proper category on the board. If someone give an incorrect category, explain what the right one is and why the food goes there.
  - Cooking methods for vegetables that can make it GO, SLOW, or WHOA.
- (5 minutes) **Wrap-up, Review, and What's Next**. Objectives:
  - Review food group and health benefits
  - Review GO, SLOW, WHOA
  - Health message: "Make half your plate fruits and vegetables"
  - At our next lesson, we will learn more about Protein.

Lesson 3 (30 minutes): Protein.

- (15 minutes) **Where do we find this food group on MyPlate?** Objectives:
  - Children will list examples of foods that are in this food group to be written on the board. Focus on both plant and animal proteins.
  - What does "lean protein" mean and why is it important? Discuss how protein helps us build muscle, grow, and stay full for longer.
    - ▪ Lesson leaders see "Protein info sheet" for points
  - Split children in two teams. Each team will write down as many examples of lean protein as they can in 5 minutes. The teams will read out loud their answers and cross off those that are on both teams' lists. The team with the most unique answers wins.
    - ❖ HANDOUT: Lean Protein Activity Handout

    - Portion size. How much protein do we need? (hand size-up)
        - Boys and girls 9-13 need ~5oz equivalents per day (1oz lean meat, 1oz poultry, 1oz fish, 1 egg, 1tbsp peanut butter, ½oz nuts or seeds, ¼ cup beans)
- (10 minutes) **GO, SLOW, WHOA**. Objectives:
    - Discuss how the foods in this food group can again be categorized as GO, SLOW, or WHOA.
    - Give examples of each category with this food group and then have children think up more examples for the categories. Write their foods in the proper category on the board. If someone give an incorrect category, explain what the right one is and why the food goes there.
    - Cooking methods for protein that can make it GO, SLOW, or WHOA.
- (5 minutes) **Wrap-up, Review, and What's Next**. Objectives:
    - Review food group and health benefits
    - Review GO, SLOW, WHOA
    - Health message: "Choose lean protein and vegetarian protein sources."
    - At our next lesson, we will learn more about Grains.

Lesson4 (30 minutes): Grains.

- (15 minutes) **Where do we find this food group on MyPlate?** Objectives:
    - Children will list examples of foods that are in this food group to be written on the board.
    - What does "whole grains" mean and why is it important? Discuss the parts of grain and why these are important.
    - List out whole grains and refined grains.
        - ❖ Handout: Make Half of your grains whole pdf
    - How much do we need? Portion size. (about 6 servings each day. 1 slice of bread, ½ cup cooked rice, cereal, or pasta) so how many servings should we make whole grains? (3)
- (10 minutes) **GO, SLOW, WHOA**. Objectives:
    - Discuss how the foods in this food group can again be categorized as GO, SLOW, or WHOA.
    - Give examples of each category with this food group and then have children think up more examples for the categories. Write their foods in the proper category on the board. If someone give an incorrect category, explain what the right one is and why the food goes there.
- (5 minutes) **Wrap-up, Review, and What's Next**. Objectives:
    - Review food group and health benefits
    - Review GO, SLOW, WHOA
    - Health message: "Make half of your grains whole."
    - At our next lesson, we will learn more about Dairy.

Lesson 5 (30 minutes): Dairy.

- (15 minutes) **Where do we find this food group on MyPlate?** Objectives:

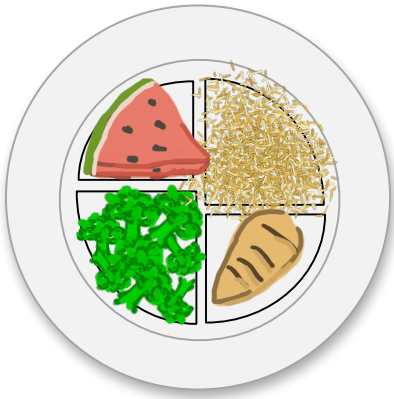
- Children will list examples of foods that are in this food group to be written on the board.
- What nutrients and health benefits we get from diary?
  - Calcium, vitamin D, strong bones and teeth, builds muscle, helps our heart…
- Discuss how each vitamins and minerals do for us.
- Types of dairy: whole fat, low-fat, fat-free, etc.
- What "dairy options" do not have these nutrients? Just because it is dairy doesn't mean it has calcium and vitamin D. (ice cream, whiped cream, pudding, butter, cream cheese, etc.) If you choose a dairy substitute like soymilk, check for fortification of these nutrients.

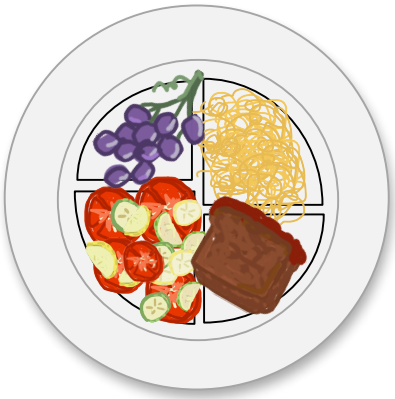
- (10 minutes) **GO, SLOW, WHOA**. Objectives:
  - Discuss how the foods in this food group can again be categorized as GO, SLOW, or WHOA.
  - Give examples of each category with this food group and then have children think up more examples for the categories. Write their foods in the proper category on the board. If someone give an incorrect category, explain what the right one is and why the food goes there.
- (5 minutes) **Wrap-up, Review, and What's Next**. Objectives:
  - Review food group and health benefits
  - Review GO, SLOW, WHOA
  - Health message: "Choose low-fat or fat-free dairy."
  - At our next lesson, we will learn more about Sweets, Snacks, and Sodas.

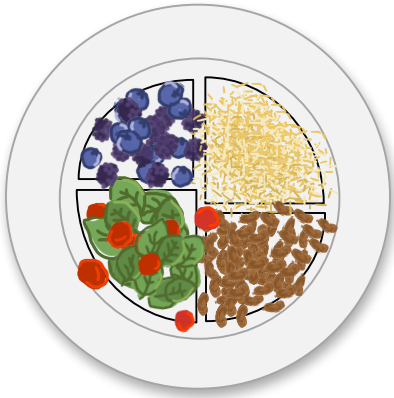
Lesson 6 (30 minutes): Sweets, Snacks, and Sodas.

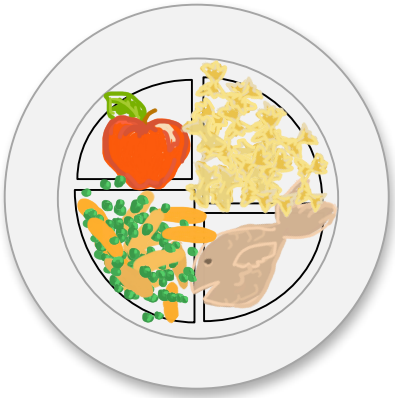
- (15 minutes) **What kinds of foods have added sugars?**
  - Talk about empty calories and why these are bad. Health risks associated with consuming too much sugar.
  - Use **sugar test tubes** to show how much added sugar is in different kinds of snackfoods.
    - ❖ HANDOUT: Sugar Beverate Hunt sheet. Children can use this to take notes on what beverages have the most sugars.
  - Have children think up better snacking options. Write their new snacking options up on the board.
- (10 minutes) **Planning a meal.**
  - Bring all food groups back into play and plan a day's worth of food as a group. Show them how each meal should add up to MyPlate and then list all the foods on a single plate to see if the sections are balanced.
  - ❖ HANDOUT: Meal Planning Handout
- (5 minutes) **Wrap-up and Review**. Objectives:
  - Review all food group and health benefits
  - Review GO, SLOW, WHOA (Definitions)
  - Health messages from MyPlate.gov
  - Where to go for more information (www.choosemyplate.gov)
  - ❖ HANDOUT: "What's On Your Plate!

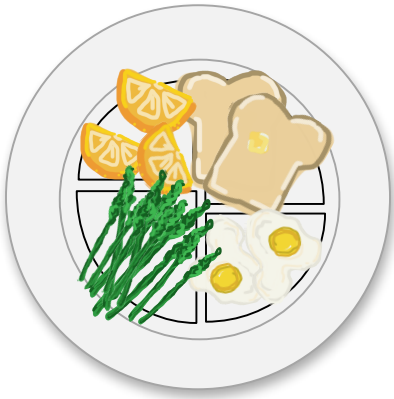
Appendix E Pre-Painted Plate Templates











Non-Art Related Hands-On Activities List

1. Mash-up: children draw a head, body, and legs. After 20 minutes of drawing, the parts will be collected, mixed up and placed face down in a pile (keeping all of the heads together, the bodies together, and legs together). Each child will draw a head, body, and legs and put them together using glue/tape to create new figure.

2. Drawing Landscapes: children will learn about the three parts of a landscape (foreground, middle ground, and background). They will be given a large piece of newsprint to draw any sort of picture they want as long as it has all three components.

3. Paper Puppets: children will use stencils to make body parts out of paper. Parts will be decorated by the child, connected with two-prong clips, and attached to a kabob stick by instructor.

4. Hand Tracings: each child will trace their own hand and fill it in with patterns and colors that represent themselves.

5. Masks: children will have mask templates to trace and cut out or design and decorate their own masks with markers. Strings will be attached so that they can be worn.

6. Paper Plains, Fans, and Lanterns: children will be provided card stock (or ½ of a manila folder) to draw on and decorate with markers and crayons. They can choose to decorate one or both sides. These will then be folded into either an airplane shape with string to hang, a hand fan, or a paper lantern with string to hang. To make the lantern, fold the cardstock long-wise and make multiple cuts along the folded side to about 1in from the other edge. Unfold and curl the long ends together into a cylinder so that the cuts spread out into a lantern shape. Staple the ends together and attach a string for hanging.

Appendix G Child Assent

My Painted Plate
Questionnaire
Pre Post Follow-up

1. What grade will you be in next year? _____

2. 2. How old are you? _____ years old

3. Are you a boy or a girl? ☐Boy
   ☐Girl

4. How do you describe yourself?
   - ☐ White
   - ☐ Black or African American
   - ☐ Hispanic or Latino
   - ☐ Asian or Pacific Islander
   - ☐ American Indian or Alaskan Native
   - ☐ Other

INSTRUCTIONS: Please **CIRCLE** your answer.

5. **Yesterday, did you eat French fries or chips?**
   Chips are potato chips, tortilla chips, Cheetos, corn chips, or other snack chips.

   a. No, I didn't eat any French fries or chips yesterday.
   b. Yes, I ate French fries or chips **1 time** yesterday.
   c. Yes, I ate French fries or chips **2 times** yesterday.
   d. Yes, I ate French fries or chips **3 times** yesterday.

6. **Yesterday, did you eat any vegetables?**
   Vegetables are salads; boiled, baked and mashed potatoes; and all cooked and uncooked vegetables.
   Do not count French fries or chips.

   a. No, I didn't eat any vegetables yesterday.
   b. Yes, I ate vegetables **1 time** yesterday.
   c. Yes, I ate vegetables **2 times** yesterday.
   d. Yes, I ate vegetables **3 times** yesterday.

7. **Yesterday, did you eat beans such as pinto beans, baked beans, kidney beans, or pork and beans?**
   Do not count green beans.

   a. No, I didn't eat any beans yesterday.
   b. Yes, I ate beans **1 time** yesterday.
   c. Yes, I ate beans **2 times** yesterday.
   d. Yes, I ate beans **3 times** yesterday.

8. **Yesterday, did you eat fruit?**
<u>Do not count</u> fruit juice.

a. No, I didn't eat any fruit yesterday.
b. Yes, I ate fruit **1 time** yesterday.
c. Yes, I ate fruit **2 times** yesterday.
d. Yes, I ate fruit **3 times** yesterday.

9. **Yesterday, did you drink fruit juice?**
<u>Fruit juice</u> is a drink, which is 100% juice, like orange juice, apple juice, or grape juice.
<u>Do not count</u> punch, kool-aid, sports drinks, and other fruit-flavored drinks.

a. No, I didn't drink any fruit juice yesterday.
b. Yes, I drank fruit juice **1 time** yesterday.
c. Yes, I drank fruit juice **2 times** yesterday.
d. Yes, I drank fruit juice **3 times** yesterday.

10. **Yesterday, did you eat sweet rolls, doughnuts, cookies, brownies, pies, or cake?**

a. No, I didn't eat any of the foods listed above yesterday.
b. Yes, I ate one of these foods **1 time** yesterday.
c. Yes, I ate one of these foods **2 times** yesterday.
d. Yes, I ate one of these foods **3 times** yesterday.

11. **Do you ever read the nutrition labels on food packages?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

12. **How many total servings of fruits and vegetables should you eat each day?**
    a. At least 2
    b. At least 5
    c. At least 9
    d. At least 10
    e. I don't know

13. **The foods that I eat and drink now are healthy.**
    a. Yes, all of the time
    b. Yes, sometimes
    c. No

14. **Do you ever eat high fiber cereal?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

15. **Do you ever eat whole wheat bread?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

16. **Do you ever drink 100% fruit juice?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

17. **Do you ever eat fruit for lunch?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

18. **Do you ever eat vegetables for dinner?**
    a. Almost always or always
    b. Sometimes
    c. Almost never or never

INSTRUCTIONS: Please **CIRCLE** one of the two foods that you would pick if you had to choose just one.

19. If you were at the movies, which one would you pick as a snack?

a. popcorn with butter

b. popcorn without butter

20. Which would you pick to drink?

a. regular milk

b. low fat or skim milk

21. Which food would you eat for a snack?

a. candy bar

b. fresh fruit

22. Which would you do if you were going to eat a piece of chicken?

a. leave on the skin

b. take off the skin and not eat the skin

23. Which food would you ask for?

a. frozen yogurt

b. ice cream

24. Which would you choose to cook if you were going to help make dinner at home?

a. French fries

b. baked potato

25. Which would you do if you were going to eat cooked vegetables?

a. eat <u>without</u> butter

b. add butter

26. Which would you order if you were going to eat at a fast food restaurant?

a. a regular hamburger

b. a grilled chicken sandwich

INSTRUCTIONS: The questions in this section ask how likely you are to eat some of the foods below. Please answer by **circling** either NOT LIKELY, LIKELY or VERY LIKELY for each question.

27. How likely are you to drink low fat or skim milk instead of regular white milk?

a. Not likely
b. Likely
c. Very likely

28. How likely are you to eat high fiber cereal instead of a donut?

a. Not likely
b. Likely
c. Very likely

29. How likely are you to eat fresh fruit instead of a candy bar?

a. Not likely
b. Likely
c. Very likely

30. How likely are you to take the skin off of chicken (and not eat the skin)?

a. Not likely
b. Likely
c. Very likely

31. How likely are you to ask for frozen yogurt instead of ice cream?

a. Not likely
b. Likely
c. Very likely

32. How likely are you to eat a baked potato instead of French fries?

a. Not likely
b. Likely
c. Very likely

33. How likely are you to drink fruit juice instead of a soft drink (a soda pop)?

a. Not likely
b. Likely
c. Very likely

34. How likely are you to order a grilled chicken sandwich at a fast food restaurant instead of ordering a hamburger?

a. Not likely
b. Likely
c. Very likely

INSTRUCTIONS: Please CIRCLE ONE of the two foods that you think is better for your health.

35.

a. broiled beef

b. broiled fish

36.

a. whole wheat bread

b. white bread

37.

a. cereal

b. eggs and bacon

38.

a. beef

b. beans

39.

a. chicken

b. regular hamburger

40.

a. regular milk

b. low fat or skim milk

a. frozen yogurt

b. ice cream

41.

a. green salad

b. French fries

42.

a. French fries

b. baked potato

43.

a. 100% fruit juice

b. fruit punch

ID number _____

Nutrition
What do you think?

Circle the best answer.

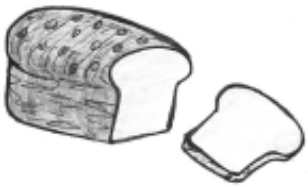
If you do not know the answer, circle ?

If you do not understand the question, leave it blank.

Thank you!

Circle the food that is ***better*** for your health

1.



whole wheat bread

white bread

I don't know

2.

milk

chocolate milk

I don't know

3.

french fries

baked potato

I don't know

4.

vegetables

chips

I don't know

5.

donut

english muffin

I don't know

6.

water

juice

I don't know

7.

fried chicken

grilled chicken

I don't know

8.

oatmeal

fruit flavored cereal

I don't know

9.

candy bar

fruit

I don't know

10.

cheeseburger

grilled chicken sandwich

I don't know

11. From which food group should you eat the ***fewest*** servings each day?

a. breads, grains
b. dairy, milk, soy milk
c. fats, oils, sweets
d. fruits and vegetables
e. meats, fish, chicken, beans, eggs, nuts
f. I don't know

12. Which of these is the ***healthiest*** way to eat vegetables?

a. steamed or boiled vegetables
b. baked potato with sour cream
c. greens cooked in oil
d. french fries
e. I don't know

13. The ***healthiest*** beverage to drink when playing hard is _____?

a. sports drinks
b. milk
c. juice
d. water
e. I don't know

14. What is a good source of Vitamin C?

a. milk
b. oranges
c. bread
d. chicken
e. I don't know

15. What is a good source of calcium?

a. milk
b. oranges
c. bread
d. chicken
e. I don't know

16. Which of these drinks is the ***healthiest***?

a. water
b. sports drinks
c. chocolate milk
d. juice
e. I don't know

17. What food group is ***not*** in a burrito made with a whole wheat tortilla, cheese, lettuce, and onions.

a. vegetables
b. dairy, milk
c. grains
d. meats
e. I don't know

18. What is the ***healthiest*** food to eat for a snack?

a. chips
b. candy bar
c. chopped vegetables
d. pudding
e. I don't know

19. What is the ***healthiest*** food to eat for breakfast?

a. donut
b. biscuit
c. oatmeal
d. fruit-flavored cold cereal
e. I don't know

20. What is a good source of fiber?

a. whole wheat pasta
b. white pasta
c. white rice
d. white bread
e. I don't know

21. Is it important to eat whole grains like oatmeal and whole wheat bread?

a. YES
b. NO
c. I don't know

22. Are all brown breads whole grain breads?

a. YES
b. NO
c. I don't know

23. Does drinking soda instead of water make healthier bodies?

a. YES
b. NO
c. I don't know

24. Is tofu a good meat substitute?

a. YES
b. NO
c. I don't know

25. Does what you eat make a difference in your chances of getting heart disease or cancer?

a. YES
b. NO
c. I don't know

26. Do apples and apple juice have the same amount of fiber?

a. YES
b. NO
c. I don't know

27. Is drinking water good for our bodies?

a. YES
b. NO
c. I don't know

28. Are fruits and vegetables high in vitamins and fiber?

a. YES
b. NO
c. I don't know

29. Is eating a lot of sweet foods bad for your health?

a. YES
b. NO
c. I don't know

30. Can it be unhealthy to drink too much fruit juice?

a. YES
b. NO
c. I don't know

Please circle how true you feel the sentence is.

1. I enjoyed the nutrition lessons of the My Painted Plate program.

Not at all true | Not very true | Somewhat true | True | Very True

2. I want to learn more about nutrition in the future.

Not at all true | Not very true | Somewhat true | True | Very True

3. I liked my teachers of the nutrition lessons.

Not at all true | Not very true | Somewhat true | True | Very True

4. I liked the art part of the My Painted Plate program.

Not at all true | Not very true | Somewhat true | True | Very True

Likert scale based on the Intrinsic Motivation Inventory from Read et al 2002.

My Painted Plate

Name of Evaluator: _____

Select one: □ Usual meal □ Larger than usual □ Smaller than usual

Child PID:	Date:	Meal Location: Time:
Food/Drink Item (Quick List)	**Details/Prep/Additions**	**Amount Eaten**

Appendix I EMR Procedure Summary Sheet

Evening Meal Dietary Recall Methods:

Directions: Sit down with each child individually. Have food models out around you to aid in portion estimation. Minimize distractions in the area. Introduce yourself to the child and let them know that you want to ask them some questions about their dinner yesterday to learn more about what children their age eat and drink.

Pass 1: Quick List

"We'll be talking about what you ate and drank for dinner yesterday.
"What did you eat at dinner?"
"What did you drink at dinner?"
"Did you eat or drink anything after dinner?"

Pass 2: Review

Interviewer reports back everything the child reported at the meal.
"Can you think of anything else you ate at that time?"
"Can you think of anything else you drank at that time?"

Pass 3: Details

"Where did you eat dinner last night?"

Details about each item, indicate additions to items, and indicate amounts consumed. Use the food models to aid in portion estimation.

*"How was each item made/cooked? Did you add anything to the _____?" (salt, butter, cheese, sauce/dressing, etc. and **how much of any of this**)*

Be sure to ask about any and all details such as **brands**, cooking **liquids**, **variations** such as fat-free, low-fat, reduced-fat, reduced-sodium, high fiber…etc.

"How much do you think you at of that? (Can refer to the food models to help the child estimate) *After you ate how much of each food was left on the plate?"*

Amounts of a food may be given in:

1. NUMBERS, such as eggs, donuts, apples
2. SHAPES, such as a pat of butter, stalk of celery, slice of pie (or the shapes included at the end of this section.)
3. DIMENSIONS, such as size of models in Recall Kit, or size of cornbread, cake, etc. using a ruler.
4. VOLUME, such as liquids, cooked vegetables, pudding, ice cream
5. WEIGHT, such as meat, cheese, candy bar, (3 oz. meat equals size of deck of cards, or palm of woman's hand)

Pass 4: Final Review

Review entire eating occasion with child for correctness.
"Can you remember anything else that you had to eat or drink at dinner last night?"
"Was this meal a typical or usual meal for your family?" (Is this something you would normally eat for dinner?) (How does this meal compare to your family's usual evening meals? About the same, bigger, smaller?)

NDSR Instructions

1. Click on round window's icon (**start menu** button) in the corner of screen
2. In search bar type in "**NDSR**" and select the 1st program that appears. When it starts it should say **NDSR 2013**.
3. Select the folder "**My Painted Plate**"
4. At the top of the menu bar, click on "**Project**" and select "**new project**".
5. Name this with the **participant's ID** you are inputting and the abbreviation should be the same #. Select "**Recall**" for the type. If there is already a project for that number (this will only happen after Post and Follow-up Assessments) do not make a new one. Simply select that one and continue.
6. At the top of the menu bar, click "**Record**" and select "**new record**". Enter the participant's ID and the date of intake (which will be the day before the recall was taken). In the notes section, write "**recall: name of assessor ; ndsr: your name".** This is in case the NDSR person and the original person who took the recall are not the same person. **Click continue**.
7. You can close the script box that pops up. Continue to the Quick List. Type **"/Dinner"** and hit **enter**. Then continue typing in the items they had for dinner. This should be what you wrote in your first boxes.
8. Click **Verify**. Click **Continue**. Fill in the information collected on your sheet. If the item on your quick list does not come up as an item, try changing the name or even break it up into parts if NDSR still can't find anything similar. Use the internet and online menus if you need to. Look up fast food restaurants or common ingredients. Choose the options in NDSR that are the closest to what the child really ate.
9. Once you are finished entering in everything, write "**NDSR: your name" and the date** on the recall sheet you just entered. Place packet back in the folder and **MAKE SURE TO LOCK THE FOLDER UP IN THE PROPPER CABINET WHEN YOU ARE DONE.**

Appendix K CATCH Constructs and Scoring

NIH We Can! 2007 Progress Report (CATCH Evaluation Tool Questions)

Name of construct/measure	Questionnaire items used to create construct/measure	Construct/measure assesses changes in…	SCORE
Food knowledge	12. How many total servings of fruits and vegetables should you eat each day? **(5)** 35. Which is better for you: broiled beef or **broiled fish** 36. Which is better for you: **whole wheat bread** or white bread 37. Which is better for you: **cereal** or eggs and bacon 38. Which is better for you: beef or **beans** 39. Which is better for you: **chicken** or regular hamburger 40. Which is better for you: regular milk or **low fat/skim milk** 40b. Which is better for you: **frozen yogurt** or ice cream 41. Which is better for you: **green salad** or French fries 42. Which is better for you: French fries or **baked potato** 43. Which is better for you**: 100% fruit juice**	Knowledge of healthier foods such as being able to identify better food choices	Correct: 2 Incorrect: 1

	or fruit punch		
Food attitudes: Self-efficacy	27. How likely are you to drink low fat or skim milk instead of regular white milk? 28. How likely are you to eat high fiber cereal instead of a donut? 29. How likely are you to eat fresh fruit instead of a candy bar? 30. How likely are you to take the skin off of chicken (and not eat the skin)? 31. How likely are you to ask for frozen yogurt instead of ice cream? 32. How likely are you to eat a baked potato instead of French fries? 33. How likely are you to drink fruit juice instead of a soft drink (a soda pop)? 34. How likely are you to order a grilled chicken sandwich at a fast food restaurant instead of ordering a hamburger?	Attitudes toward healthier eating habits including likelihood of choosing healthier foods	"not likely":1 "likely":3 "very likely":5
Food attitudes: intentions to reduce fat	19. If you were at the movies, would you pick buttered or **unbuttered popcorn** as a snack? 20. Would you eat a candy bar or **fruit** for a snack? 22. If you were going to eat a piece of chicken would you eat it with	Attitudes toward healthier foods including intentions to reduce intake of higher-fat foods	High-fat: 1 Lower fat: 2

	the skin on or **skin off**? 23. Would you ask for **frozen yogurt** or ice cream? 24. Would you choose French fries or **baked potato** to cook if you were going to help make dinner at home? 25. If you were going to eat cooked vegetables would you eat them with or **without butter**? 26. If you were going to eat at a fast food restaurant would you order a hamburger or **grilled chicken sandwich**?		
Food attitudes: intentions to drink skim milk	20. Would you pick whole milk or **low-fat/skim milk** to drink?	Attitudes toward healthier food; specifically the intention to drink lower fat milk	High-fat: 1 Lower fat: 2
Healthy eating behaviors: reducing fat	5: Yesterday, did you eat French fries or chips? 10. Yesterday, did you eat sweet rolls, doughnuts, cookies, brownies, pies or cake?	Healthier eating behaviors; specifically eating lower-fat foods	"I didn't eat any": 1 "I ate it once": 2 "I ate it 2 times": 3 "I ate it 3 or more times": 4
Healthy eating behaviors: eating fiber	14. Do you ever eat high fiber cereal? 15. Do you ever eat whole wheat bread?	Healthier eating behaviors such as intake of higher-fiber foods	"almost always or always": 5 "sometimes": 3 "almost never or never": 1
Healthy eating behaviors: eating	6. Yesterday, did you eat any vegetables?	Healthier eating behaviors related	"I didn't eat any": 1

fruits and vegetables	7. Yesterday did you eat beans? 8. Yesterday, did you eat fruit? 9. Yesterday, did you drink fruit juice? 13. The foods that I eat and drink now are healthy. 16. Do you ever drink 100% fruit juice? 17. Do you ever eat fruit for lunch? 18. Do you ever eat vegetables for dinner?	to intake of beans, fruits and vegetables	"I ate it once": 2 "I ate it 2 times": 3 "I ate it 3 or more times": 4
Healthy eating behaviors: reading labels	11. Do you ever read the nutrition labels on food packages?	Healthier eating behaviors; specifically reading nutrition labels	"almost always or always": 5 "sometimes": 3 "almost never or never": 1

VITA

Abby Forman graduated high school from Lake Braddock Secondary School in 2007. She obtained her undergraduate degree from Virginia Polytechnic Institute and State University (Virginia Tech), where she volunteered in a variety of dietetics areas. Abby graduated from the Virginia Tech in 2013 with a Bachelor's of Science in Human Nutrition Food and Exercise with a concentration in Dietetics and a Bachelor's of Fine Arts. Abby began the graduate program at the University of Tennessee, Knoxville the following fall, and is currently pursuing her Master's of Science in Nutrition with a concentration in Public Health Nutrition. She is expected to graduate in August 2015. At the University of Tennessee, Knoxville, Abby accepted a graduate research assistantship and had the opportunity to work with a multi-state research group called the Healthy Campus Research Consortium on their research for the iCook 4H study. She had the privilege of presenting part of the research from the College Environment Behaviors and Perceptions Survey (CEBPS) study at the Food and Nutrition Conference and Expo (FNCE) annual conference in Atlanta, Georgia in the fall of 2014. She is currently in the dietetic internship in Knoxville, TN.